Contract No.: EP-W-09-002
WA #: 070-RICO-A238

Region 2 RAC2
Remedial Action Contract

Final Remedial Investigation Report

Mansfield Trail Dump Site, Operable Unit 2 (Groundwater)

Remedial Investigation/Feasibility Study

Byram Township, New Jersey

May 10, 2019

565377

CDM Smith

CDM Smith
14 Wall Street, Suite 1702
New York, New York 10005
tel: 212-785-9123
fax: 212-227-1692

May 10, 2019

Ms. Anne Rosenblatt
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, NY 10007-1866

PROJECT:	EPA Region 2 RAC2 Contract No.: EP-W-09-002 Work Assignment No.: 070-RICO-A238
DOC. CONTROL NO.:	3323-070-03851
SUBJECT:	Final Remedial Investigation Report Mansfield Trail Dump Site, Operable Unit 2 (Groundwater) Remedial Investigation/Feasibility Study Byram Township, New Jersey

Dear Ms. Rosenblatt:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit the electronic version of Final Remedial Investigation Report for Operable Unit 2 of the Mansfield Trail Dump Site in Byram Township, New Jersey.

If you have any questions regarding this submittal, please contact me at your earliest convenience at (732) 590-4662.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Larry Jordan, P.G.
Site Manager

PSO: KS

Enclosure

Cc: See Attached Distribution List

Mansfield Trail Dump Site, Operable Unit 2 (Groundwater)
Final Remedial Investigation Report
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Acronyms

µg/kg	microgram per kilogram
µg/L	microgram per liter
µg/m^3	microgram per cubic meter
AE	assessment endpoint
ARAR	applicable or relevant and appropriate requirement
ATV	acoustic televiewer
amsl	above mean sea level
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
BTV	background threshold value
CDM Smith	CDM Federal Programs Corporation
cm	centimeter
cm/s	centimeters per second
C_{OC}	total organic carbon content
COOP	National Weather Service Cooperative Network
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CSIA	compound-specific isotope analysis
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCA	dichloroethane
DCB	dichlorobenzene
DCE	dichloroethene
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DESA	Division of Environmental Science and Assessment
DESR	Data Evaluation Summary Report
DNAPL	dense nonaqueous phase liquid
DOH	Sussex County Division of Health
DPT	direct push technology
DUSR	data usability summary report
EES JV	Engineering & Environmental Solutions
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERRS	Emergency and Rapid Response Services
ESB	equilibrium partitioning sediment benchmark
FS	feasibility study
ft	feet
ft/day	feet per day
ft^2	square feet
gpm	gallons per minute
HHRA	human health risk assessment

HPFM	heat pulse flowmeter
HQ	hazard quotient
HSDB	Hazardous Substance Databank
ITRC	Interstate Technology Regulatory Cooperation
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
LNAPL	light nonaqueous phase liquid
LOAEL	lowest observed adverse effect level
mL/g	milliliter per gram
MIP	membrane interface probe
mg/kg	milligram per kilogram
MLS	multi-level system
MNA	monitored natural attenuation
NAPL	nonaqueous phase liquid
NJDEP	New Jersey Department of Environmental Protection
NOAEL	no observed adverse effect level
ORP	oxidation-reduction potential
OTV	high-resolution digital color optical video televiewer
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PID	photoionization detector
POET	point-of-entry-treatment
ppbv	parts per billion by volume
QAPP	quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
site	Mansfield Trail Dump Site, Operable Unit 2
SIM	selective ion monitoring
SLERA	screening level ecological risk assessment
SRC	site-related contaminant
SSDS	sub-slab depressurization system
SVOC	semi-volatile organic compound
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethene
TCL	target compound list
T&E	threatened and endangered
TOC	total organic carbon
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UTS	Universal Treatment Standard
VISL	vapor intrusion screening level
VOC	volatile organic compound

WA	work assignment
Weston	Weston Solutions, Inc.
XRF	x-ray fluorescence

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Executive Summary

CDM Federal Programs Corporation (CDM Smith) received Work Assignment (WA) 070-RICO-A238 under the Remedial Action Contract 2 Contract No. EP-W-09-002 to conduct a remedial investigation (RI)/feasibility study (FS) for the U.S. Environmental Protection Agency (EPA), Region 2 at the Mansfield Trail Dump Site, Operable Unit 2 (the site), located in Byram Township, New Jersey. The purpose of this WA is to investigate the overall nature and extent of contamination and develop remedial alternatives at the site.

Site Location and Description

The site consists of former waste disposal trenches located on wooded, undeveloped properties and associated groundwater contamination extending into an adjacent residential neighborhood in Byram Township, Sussex County, New Jersey. Trichloroethene (TCE) has migrated in groundwater from the source area to nearby residential supply wells at concentrations significantly above background. Cis-1,2-dichloroethene (cis-1,2-DCE) and several other contaminants have also has been detected in the impacted residential wells. The site has been divided into two operable units (OUs) to address the contamination. OU1 focuses on the impact of contaminated groundwater to receptors in the adjacent residential neighborhood in Byram Township and has been addressed separately in a focused feasibility study. This RI is conducted as part of OU2, addressing the contamination in and around the former waste disposal trenches (dump areas), associated groundwater contamination, downgradient residential areas (properties along Brookwood Road and Ross Road), and downgradient drainage areas (Cowboy Creek and Lubbers Run).

Site History and Previous Investigations

In 2005, TCE was detected in a private bedrock drinking water well in the residential area. This discovery triggered the Sussex County Division of Health and New Jersey Department of Environmental Protection (NJDEP) to sample approximately 75 private wells in the area from 2005 through 2006. Based on these results, point-of-entry treatment (POET) systems were installed in 18 residences. Vapor intrusion investigations conducted by NJDEP from 2006 to 2008 in the residential area also lead to the installation of sub-slab depressurization systems (SSDSs) inside five affected residences. Currently, 19 properties have POET systems installed.

NJDEP conducted additional investigations to determine the source of the TCE groundwater contamination. The five former dump areas (A through E) were first identified by NJDEP in 2009 and determined to be the source of contamination. NJDEP conducted soil investigations and installed monitoring wells in the former dump areas (source areas) in 2009. EPA continued these investigations and installed additional monitoring wells in 2010. EPA also conducted well water sampling at 21 residences in the residential area. In 2011 and 2012, EPA also collected sub-slab and indoor air samples from residences. After performing a removal site evaluation, EPA concluded that a Comprehensive Environmental Response, Compensation, and Liability Act removal action was warranted to address the threats posed by the former waste disposal areas (i.e., trenches) at the site.

In March 2011, based on the impacted disposal and residential areas outlined above, the site was added to the National Priorities List. On September 29, 2011, an Action Memorandum was approved by EPA for the excavation and off-site disposal of TCE-contaminated soil at the site. From February 21 to May 30, 2012, EPA completed excavation activities to remove soil contamination from Dump Areas A, B, D, and E. EPA's Emergency and Rapid Response Services contractor delineated impacted areas, characterized waste, excavated and disposed of contaminated soils, conducted post-removal confirmation sampling, and backfilled and graded each excavation. Dump Area C was not excavated because the delineation sampling did not reveal contaminant concentrations exceeding NJDEP Site Remediation Soil Cleanup Standards for impact to groundwater.

From August 2013 to December 2015, EPA's contractor, Engineering and Environmental Solutions Joint Venture (EES JV), performed RI activities at this site. The contractor performed site reconnaissance activities and collected environmental data, including samples of overburden and subsurface soil, groundwater, surface water, and sediment. These results are described in the *Revised Data Evaluation Summary Report (DESR) for the Mansfield Trail Dump Site* (EES JV 2016). The findings of the EES JV investigations have been incorporated into the RI report (CDM Smith 2018).

RI Study Area Investigations

Environmental media investigated during the 2017 and 2018 RI field activities included the following:

- Soil – Surface soil sampling was conducted at 12 locations to target areas where surficial runoff has likely mobilized contamination from the former dump areas impacting soils in the residential areas.

- Surface Water/Sediment – Ten seeps, springs, and catch basins were sampled within the residential areas downgradient of the former dump areas. Two paired surface water and sediment samples were collected in Cowboy Creek.

- Groundwater – Three FLUTe multi-level system (MLS) wells and two conventional wells (one well pair) were installed in bedrock. Transmissivity testing, geophysical logging, and packer testing was also conducted at each well location. Three piezometers were installed for groundwater sampling in Cowboy Creek. Three rounds of groundwater samples were collected from both newly installed and existing site monitoring wells and piezometers. However, Round 1 groundwater sampling data were excluded from this RI report due to uncertainties in data quality.

Physical Characteristics of the Site

Surface Features

The site is located along the spine of a northeast-southwest trending ridge forming the western edge of the drainage basin for Lake Hopatcong. One of the source areas, Dump Area A, is situated at the top of the ridge. The northwest side of the ridge slopes down to the residential area along Brookwood Road and Brookwood Drive. The slope becomes more gradual northwest of the residential area, flattening into the Cowboy Creek Area. Southeast of the ridge crest, the topography quickly drops to a flat area containing Dump Areas B, C, and E. Dump Area D extends along the flank of the ridge into the northern portion of the same flat area. The eastern edge of the lower dump areas is bounded by a former railroad bed, which is within a steep narrow valley.

A public pedestrian and bicycle path runs north-south parallel to the former railroad bed and connects to Stanhope-Sparta Road via an overpass in the southern portion of the site. An intermittent stream flows in a drainage swale within the railroad bed that forms the eastern boundary of the former dump areas. The stream flows north and joins with Cowboy Creek to travel northwest in a well-defined channel through a wetland. This wetland area also receives runoff from surrounding hills, including the site ridge to the south. Cowboy Creek then travels west-southwest before meeting with Lubbers Run.

Geology

The site is in a physiographic province known as the Highlands. The Highlands include rugged terrain and mountainous uplands consisting of erosion-resistant rocks in northeast-southwest trending ridges.

Overburden deposits cover the entire site, except on the steep northwest face of the ridge and in the former railroad bed where bedrock outcrops. Most of the overburden encountered consisted of a non-stratified, loose, dry brown to gray sand/silt mix with varied amounts of gravel and cobbles. The overburden is relatively thin (less than 5 feet [ft] thick) along the top and flanks of the ridge. Overburden thickness generally increases in the flat areas to the southeast of the ridge within the source area.

Bedrock outcrops are located across the site, and the depth to bedrock elsewhere at the site ranges from near-surface to approximately 25 ft below ground surface (bgs). In the residential area north of the site, the bedrock elevation drops almost 300 ft from the ridge north toward Cowboy Creek. The bedrock surface in the source area was observed as being uneven and fractured. The upper 5 to 10 ft of the bedrock is extremely weathered, fractured, and unstable, as evidenced by drilling notes and casing depths.

The deeper bedrock is a hard, crystalline gneiss and pyroxene syenite bedrock with low primary porosity and low potential for matrix diffusion. Because of the low primary porosity, groundwater flow is primarily in the secondary porosity of the rock which is formed by the weathered zone in the shallow bedrock and by features (e.g., bedding planes and fractures) in the bedrock.

Borehole geophysical and packer testing found that, in general, the transmissive fractures occur at a frequency of less than one fracture every 2 ft, and the highest density of transmissive fractures occurs in the upper 100 ft of each boring. Stereonets mapping the transmissive fractures found one cluster of fracture features in the northwest quadrant dipping generally to the southeast at a dip angle of 45 degrees, and a second cluster of features in the southeast quadrant dipping generally to the west-northwest at a dip angle of about 55 degrees.

Hydrogeology

The conceptual groundwater flow model is as follows:

Groundwater Zones

- ***Overburden*** – In the source area, the saturated zones in the overburden are discontinuous and limited to the lower dump areas between the ridge and the former railroad bed. At other locations within the source areas, the overburden is unsaturated because infiltrating rainwater drains into the underlying bedrock surface. The overburden also underlies the residential and Cowboy Creek areas and is typically saturated. Water depths in the overburden range from just below the ground surface in the Cowboy Creek area to greater than the full thickness of the overburden in parts of the source area where the water table lies below the overburden during dry periods. The thickest unsaturated overburden is found in the area of MLS-5 (15 ft).

- ***Bedrock*** – Data on the extent, orientation, and transmissivity of fractures was considered in defining the shallow, intermediate, and deep bedrock zones, but they should not be considered separate units as flow can move through high angle fractures that cross between zones.

  - ***Shallow bedrock*** – This zone directly underlies the source area (in the elevation range of 800 to 900 ft above mean sea level [amsl]) and pinches out to the west toward the residential area and Cowboy Creek as the surface topography drops below these elevations. The shallow bedrock zone is defined by a higher density of transmissive or potentially transmissive fractures in the upper 100 ft of each borehole in the source area. This zone is fully saturated with the exception of the northern source area (MLS-2, MLS-5, and MLS-7) where the water table ranged from 24.9 to 42.5 ft bgs in January 2018.

  - ***Intermediate bedrock*** – This zone underlies the shallow bedrock zone, occurs in the elevation range of 650 to 800 ft amsl, and pinches out to the west toward Cowboy Creek as the surface topography drops below these elevations. The intermediate zone is characterized by fewer transmissive or potentially transmissive fractures than the shallow and deep bedrock zones.

  - ***Deep bedrock*** – This zone underlies the intermediate bedrock zone, occurs in the elevation range of 500 to 650 ft amsl, is laterally continuous from beneath the source area to the west toward Cowboy Creek, and is defined by higher concentration of transmissive fractures than the intermediate zone. The deep zone provides a pathway for groundwater to move in the bedrock system horizontally from beneath the source areas toward Cowboy Creek.

Groundwater Movement

- Precipitation enters the overburden at the top of the ridge (the source areas), flows down through the vadose zone in the shallow bedrock and enters the saturated zone.

- From this high point in the fractured bedrock groundwater flow system, some groundwater flows down the dip azimuth of the northwest set of transmissive features, some groundwater flows down the dip azimuth of the southeast set of transmissive features, and some groundwater flows directly into the deeper bedrock.
- Groundwater flows downward and to the northwest from the shallow bedrock zone into the intermediate bedrock zone or discharges to seeps along the bedrock cliff face. Some of the flow in the intermediate bedrock zone discharges to the overburden, between wells MLS-9 and MLS-11, and some of the flow moves more vertically, entering the deep zone through high angle fractures. In the deep bedrock zone, groundwater flows to the northwest toward the Cowboy Creek area.
- Much like the high angle fractures encountered, residential wells, such as BYR-DW124 and BYR-DW120, are open boreholes, providing a vertical conduit for groundwater migrating from the source area to mix and move vertically into the deeper bedrock. Based on the observations obtained during geophysical logging, downward vertical fluid movement would be expected to happen under ambient conditions, i.e., with the pump off, and would be exacerbated by pumping.

Ecological Characterization

The former dump areas offer an edge habitat since they are directly within the cleared utility easement and are surrounded by forested areas. The edge habitat includes a variety of grasses and herbaceous plants throughout the utility easement that offer food and habitat for a variety of fauna. In addition, the easement provides a corridor for animals to travel throughout the area. The steep slope from the dump areas sloping down northward to the residences supports a mature deciduous forest that continues into the Cowboy Creek area. This general area also consists of a freshwater creek (Cowboy Creek) and a wetland. Habitats throughout the site appear suitable to support a variety of ecological receptors and communities. While not observed, it is likely that a variety of bird, mammal, reptile, and amphibian populations can be supported by the available habitat.

Threatened and endangered species that may exist at or near the site include the Indiana bat (*Myotis sodalist*), threatened northern long-eared bat (*Myotis septentrionalis*), threatened bog turtle (*Clemmys muhlenbergii*), and threatened small whorled pogonia (*Isotria medeoloides*). Although these species were not observed during the survey, the project area contains suitable habitat for each of the species.

Species of concern (rare wildlife species) that were found on-site and within the area included several bird species, one mammal species—the bobcat (*Lynx rufus*)—and one reptile species of concern—wood turtle (*Glyptemys insculpta*).

Nature and Extent of Contamination

RI sample results were compared to site-specific screening criteria and calculated background threshold values (BTVs) to evaluate contamination detected in site soils, groundwater, surface water, sediment, and vapor.

Selection of Site-Related Contaminants

Discussion of volatile organic compounds (VOCs) contamination is focused mainly on chlorinated VOCs (CVOCs), primarily TCE and its breakdown products. These are considered the primary site-related contaminants (SRCs) since they have historically been the most widely detected contaminants (previously in the dump area soils) and have recently been detected at elevated concentrations in soils, groundwater, surface water, and vapor.

Other SRCs include 1,4-dioxane, semi-volatile organic compounds (SVOCs) (specifically polycyclic aromatic hydrocarbon [PAHs]), pesticides, polychlorinated biphenyls (PCBs) (specifically Aroclor 1254 and Aroclor 1260), and metals (particularly lead and chromium). These are considered secondary SRCs due to their more limited distribution, concentrations, and/or frequency of detections as compared to CVOCs.

Analytical Results and Evaluation

Volatile Organic Compound Contamination

Source Area

Prior to the removal action in 2012, investigations at the former dump areas A through E revealed significant CVOC contamination at Dump Areas A, B, D, and E primarily from TCE and cis-1,2-DCE at concentrations up to 2,900 and 340 milligrams per kilogram (mg/kg), respectively. Other VOCs, including benzene and 1,2-dichlorobenzene, also were detected at elevated concentrations. Contaminated soils in these dump areas were excavated. Sample results at Dump Area C did not reveal any contaminant concentrations above NJDEP soil cleanup standards. As a result, no excavation was performed at this dump area. Dump Areas A, B, D, and E were backfilled and graded with clean excess soils from Dump Areas A and B.

After the removal action, EES JV conducted overburden field screening and soil sampling in the source area. Review of the results found that the majority of the VOC contamination was removed from the former dump areas. This was supported by the soil gas and membrane interface probe results, which suggested minor impacts within the overburden soils in and around the former dump areas.

Nonaqueous phase liquid (NAPL) was encountered at 68 ft bgs in a rubble zone in a rock core (CB-3) and between 100 and 150 ft bgs in a bedrock well (MLS-2), both north of Dump Area D. However, based on recent groundwater sampling results (Round 2 and Round 3), these observed NAPLs are likely localized and not the only source contributing to the groundwater plume.

Groundwater

The November 2017 sampling event was a comprehensive round and is used to describe the full current extent of CVOC contamination. The highest concentrations of TCE and other CVOCs detected during November 2017 were in the bedrock monitoring wells installed beneath the former dump areas with concentrations up to 180 micrograms per liter (µg/L) beneath Dump Area A and up to 88 µg/L beneath Dump Area D. The migration of groundwater from the elevated former dump areas to the north-northwest is limited to flow from the elevated areas through the fractured bedrock system, discharging to surficial seeps and the downgradient overburden groundwater, or flowing deeper into the bedrock system through high angle fractures. Sampling data from the overburden groundwater (in the residential and Cowboy Creek areas) and from seeps and other shallow groundwater discharges from or near the bedrock cliff face confirms that TCE contamination has followed these pathways. Contaminant concentrations quickly decrease in bedrock groundwater farther from the elevated source areas.

Cis-1,2-DCE concentrations were found primarily at the northern end of Dump Area D (MLS-2) and east of Dump Area E (MLS-6) in the shallower portion of the bedrock aquifer with maximum concentrations in MLS-2 at 230 µg/L (from 35 to 50 ft bgs). This suggests that the source of groundwater CVOC contamination in this area is localized, possibly made up of a different blend of CVOCs or more degraded as compared to the source of the TCE below Dump Area A, which shows little evidence of degradation. The migration of cis-1,2-DCE into the downgradient overburden aquifer and deep bedrock mirrors that of TCE, but at lower concentrations.

The data from the November 2014 groundwater sampling event showed a system with low water levels after a period with limited precipitation. TCE concentrations at the water table below the dump areas were more elevated, and contamination generally decreased with depth and was not detected at a distance as far from the source areas or as deep within the deep bedrock flow system as observed in 2017. CVOC contamination in the deeper system contained relatively higher concentrations of cis-1,2-DCE, potentially because TCE from the source areas had not been transported by infiltration and recharge to the deeper groundwater due to the limited precipitation or snow melt at the time.

Within the residential wells downgradient of the former dump areas, TCE concentrations appear to be generally consistent over time. There appears to have been a slight decreasing trend from 2005 to 2012. Concentrations from the 2013 sampling, which was one year after the source removal activities, generally increased and then began a downward trend in the years that followed. The increase in concentrations may have been caused by the disturbance of a vadose zone source during excavation or drilling that may have mobilized contamination into the system. However, differences in November 2014 and 2017 sampling results in the source areas indicate that concentrations are complicated by the amount of infiltration entering the system.

Downgradient Soils and Sediments

VOCs were not detected above RI screening criteria in the residential soils and downgradient sediments.

Indoor Air

Multiple rounds of sub-slab and indoor air samples collected at residences associated with the residential wells (from 2011 to 2018) were analyzed.

TCE concentrations in sub-slab vapor generally decreased from 2011 to 2018 in most properties except for one, indicating contaminants are continuing to volatilize from the groundwater plume. However, decreasing indoor air concentrations reflect the effectiveness of the existing active vapor mitigation systems.

Other Contaminants

SVOCs

PAHs were detected above RI screening criteria and BTVs in surface soils at a few locations in and around the former dump areas and in sediment adjacent to the former railroad bed next to the site. The soil and sediment PAH data suggest only minor isolated impacts related to site dumping. The PAHs found in the former railroad bed area are likely related to the rail ties or other processes that left behind these materials (not site-related).

In addition, 1,4-dioxane was found in site groundwater and surface water. Maximum detections were noted in the wells screened below the former dump areas, and the overall extent of the 1,4-dioxane appears similar to that of the CVOC contamination observed. Slightly elevated concentrations suggest the site as a possible source, but concentrations show this to be a secondary concern to the CVOC contamination.

Pesticides

Pesticides did not exceed RI screening criteria in site soils, surface water, or groundwater samples. Pesticides were found slightly above screening criteria at the sediment sample in the former railroad bed area. Since this location is downgradient from the former Dump Area D, the sediment contamination is possibly a result of historical runoff from pesticide-contaminated soils in Dump Area D prior to excavation. The contamination at this location is most likely an isolated exceedance, considering pesticides have not been found at elevated concentrations in site soils since the removal action.

Polychlorinated Biphenyls

PCB Aroclors (particularly Aroclor 1254 and Aroclor 1260) were detected in both the former dump areas and an adjacent residential area. Generally, the PCBs appeared confined to the upper 2 ft of soil concentrated in an area north of Dump Area A and continued downslope into the rear (southern) portion of a residential property on Brookwood Road (location of the BYR-DW120 residential well).

PCBs were not detected in other site media, including sediments, surface water, or groundwater.

Metals

Lead and chromium were both detected above RI screening criteria in soil samples from the former dump areas and the adjacent residential area. Within the former dump areas, lead and chromium exceedances of RI screening criteria were primarily located in the surface soils (less than 2 ft bgs). This contamination likely represents the excess soils from Dump Areas A and B that were backfilled into the former dump areas after the excavation. Much like the PCBs, the most elevated lead and chromium concentrations were concentrated in an area north of Dump Area A and continued downslope into the rear (southern) portion of a property on Brookwood Road.

Both metals were also detected in sediments and surface water. Lead was detected only slightly exceeding RI screening criteria in groundwater. The lead and chromium data in surface water and sediment suggest natural background conditions for the creeks.

There were several other metals besides lead and chromium that were detected above RI screening criteria in soils, sediment, and surface water. These metals either exceeded criteria in few locations or were found below the BTVs calculated based on the background samples. No additional metals were found above screening criteria in site groundwater.

Fate and Transport of Contaminants

The primary site-related contaminants are CVOCs, particularly TCE since it is the most widespread SRC across the various media sampled. The fate and transport aspects for the primary SRCs are summarized below.

- TCE and cis-1,2-DCE contamination has historically been found in Dump Areas A, B, D, and E. It is likely that the chemicals were released directly to the ground surface in the dump areas either as nonaqueous phase product or dissolved in septic waste, wastewater, or wash water. However, the contamination has been largely removed from the soil overburden source areas during the excavation removal action in 2012. The majority of TCE and cis-1,2-DCE contamination remaining is in the fractures of the bedrock below the former dump areas. Sufficient residual contamination is present in the bedrock fractures for groundwater contamination to still be present after the excavations.

- The primary SRCs likely reached the bedrock groundwater zone at the site either dissolved in rainwater, dissolved in wastewater/wash water released in a source area, or potentially as a limited release of dense nonaqueous phase liquid (DNAPL). From the bedrock zone below the source areas, both TCE and cis-1,2-DCE have migrated through bedrock groundwater fractures into the overburden and bedrock groundwater system below the residential and Cowboy Creek areas. This is consistent with the understanding that groundwater transports contamination in numerous directions through a complex system of fractures propagating away from the elevated bedrock ridge where the former dump areas were located.

- TCE in the groundwater has partitioned into the gaseous phase and migrated as vapor, as confirmed by the sub-slab and indoor air results observed in select residences downgradient of the former dump areas. These residences have had SSDSs installed or radon systems upgraded to address vapor intrusion issues. Similarly, cis-1,2-DCE also has volatilized into the unsaturated zone in the residential area, but to a lesser degree, as evidenced by the occasional trace concentrations detected below residential screening criteria in sub-slab vapor and indoor air.

- From the overburden groundwater downgradient of the source areas, TCE has migrated into the Cowboy Creek wetland area, discharging to the creek at relatively low, diluted concentrations. Once in the surface water, TCE will volatilize into the atmosphere or become diluted downstream. Cis-1,2-DCE also has been detected at low concentrations in the creek, mirroring the extent of TCE contamination. However, both contaminants were detected below RI screening criteria for surface water.

- Evidence indicates that both microbial reductive dehalogenation and aerobic co-metabolic degradation of TCE are biodegradation mechanisms actively attenuating groundwater concentrations at the site. The principle zone of reactivity for destructive attenuation appears to be under and directly adjacent to the former dump areas. Significantly less microbial biomass is present downgradient, indicating less bioreactivity. Cis-1,2-DCE showed only limited biodegradation throughout the site and attenuation of this compound is expected to be driven by non-destructive processes instead (i.e., dilution and dispersion).

- Other SRCs identified during RI field investigations include 1,4-dioxane, metals, and PCBs. These SRCs are also discussed below:
  - Concentrations of 1,4-dioxane contamination in groundwater mirrors TCE contamination distribution below the former dump areas and residential area downgradient, but at much lower concentrations (up to 4.1 µg/L). Since it is completely miscible in water, 1,4-dioxane is unlikely to volatilize above a dissolved phase plume in groundwater. This is confirmed by 2012 and 2014 sub-slab vapor samples that did not exceed the screening criterion for 1,4-dioxane (18.7 micrograms per cubic meter).
  - PCBs, lead, and chromium were identified in shallow soils in an area north of Dump Area A and downslope into the rear of a residential property on Brookwood Road. These chemicals strongly sorb to soil and sediment, which explains the absence of these contaminants in the groundwater plume. Physical transport through surface water runoff explains the presence of these contaminants in the residential area downslope from the dump areas.

Conclusions and Recommendations

Sources

- The waste disposed in the dump areas is the original source of VOC contamination at the site. Waste disposal (dumping) activities began between 1956 and 1959 and ended between 1973 and 1974. Waste disposed in Dump Areas A and D was primarily septic waste. Dump Areas B, C, and E (approximately 75,000 square feet were covered with potentially contaminated fill materials.

- The waste materials in the source areas was excavated down to the top of bedrock in 2012. Sampling prior to excavation detected TCE concentrations indicative of DNAPL (greater than the 1 percent solubility threshold of 14.7 mg/kg) in overburden soils primarily in Dump Areas A and D. Post excavation sampling found little evidence of remnant CVOC contamination in the overburden within or near the former dump areas. Prior to their removal in 2012, VOCs in waste materials migrated through the shallow overburden material at the top of the ridge and into the fractured bedrock system.

- Site geology along the top and flanks of the ridge where the former waste disposal areas are located is characterized by a thin overburden, typically less than 10 ft thick, overlying gneiss and syenite bedrock. This bedrock is a hard, crystalline bedrock with low primary porosity and low potential for matrix diffusion. Prior to their removal in 2012, VOCs in waste materials migrated through the shallow overburden material at the top of the ridge and into the fractured bedrock system.

Contaminant Fate and Transport

- The shallower bedrock is more weathered, consisting of a greater density of hairline fractures, discontinuous fractures, and rubble zones. Many of the fractures are likely dead-end and not the type that are flushed regularly by infiltrating groundwater. Contaminants that entered the bedrock from the waste disposal are potentially stored in the dead-end fractures or within rubble zones (as encountered in rock core CB-3). Sorbed contaminant mass present in these infilled fractures and rubble zones acts as a continuing source of contaminant mass. During rain events, precipitation transports contamination from the residual sources to the water table.

- Once in groundwater, contamination migrates downgradient through advection in the secondary porosity of the bedrock. Transmissive fractures are abundant in the bedrock, with potential transmissivity at almost all intervals of boreholes. Groundwater migrates from the higher-elevation former dump areas to the north-northwest, discharging to surficial seeps and the overburden groundwater in the lower areas or flowing deeper into the bedrock system.

- The extent of overburden groundwater contamination appears limited, extending to and discharging to Cowboy Creek or the nearby wetlands. The contamination in the deeper bedrock groundwater extends laterally in the fractured rock aquifer as far as MLS-11 and MLS-13 and vertically to depths up to approximately 400 ft bgs in MLS-11.

- CVOC concentrations have generally decreased from 2014 to 2017 in bedrock immediately below source areas but have been detected at higher concentrations over a greater lateral and vertical distance from the source areas in bedrock.

- In the deeper bedrock, biodegradation, dilution, and dispersion mechanisms reduce concentrations quickly in the bedrock flow system northwest of Brookwood Road.

- Evaluation of natural attenuation data indicate that microbial reductive dehalogenation and aerobic cometabolic degradation are actively attenuating groundwater concentrations of TCE and its degradation products at the site.

- CVOC mass is volatilizing from the groundwater over the plume, thus, increasing CVOC vapor concentrations in soil gas and sub-slab air beneath homes along Brookwood Road to levels that have required vapor mitigation systems to be installed in structures over the plume. Contaminant mass is being removed through volatilization from groundwater.

Soil, Surface Water, and Sediment

- CVOCs were not found in downgradient soils or sediment but were found at low concentrations in Cowboy Creek due to groundwater discharge into the surface water bodies.

- PCBs, lead, and chromium were identified in shallow soils in an area north of Dump Area A and downslope into the rear of a residential property on Brookwood Road. In general, metals are sorbed to soils at neutral pH. Similarly, PCBs strongly sorb to soil and sediment. For PCBs, lead, and chromium, physical transport (e.g., erosion and entrainment of contaminated soil particles in surface runoff) is the primary transport mechanism. This transport mechanism explains the presence of these contaminants in localized areas downslope from the dump areas.

Recommendations

- In consultation with EPA, CDM Smith recommends herein that the Mansfield Trail Dump Site RI/FS continue with FS evaluations and development of remedial alternatives for the contaminated media.
- Additional investigations into the extent and location of any potential remnant sources in the vadose zone may be performed during the remedial design phase since the additional data are not expected to affect the FS remedial alternatives evaluations. This information will assist in better targeting in situ treatment for any residual sources that may be contributing mass to the groundwater plume. Results could be summarized in the pre-design investigation report.

Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received Work Assignment (WA) 070-RICO-A238 under the Remedial Action Contract 2 Contract No. EP-W-09-002 to conduct a remedial investigation (RI)/feasibility study (FS) for the U.S. Environmental Protection Agency (EPA), Region 2 at the Mansfield Trail Dump Site, Operable Unit 2 (the site), located in Byram Township, New Jersey. The purpose of this WA is to investigate the overall nature and extent of contamination and develop remedial alternatives at the site.

1.1 Purpose of Report

The objectives of this RI are to:

- Review and evaluate the studies and investigations performed at the site to date
- Identify if source areas remain at the site through soil and groundwater investigations; define the hydrogeologic framework; evaluate the nature and extent of contamination in groundwater, soil, surface water, sediment, porewater, soil vapor, and indoor air; and develop a conceptual site model (CSM)
- Provide adequate data to complete human health and ecological risk assessments, prepare an FS, and support the selection of an approach for site remediation and development of a record of decision

The following field investigation activities were conducted to meet the RI objectives: bedrock packer and geophysical testing; monitoring well installation; and sampling of groundwater, soil, surface water, sediment, porewater, and air, including both indoor air and sub-slab soil vapor. This report details the activities conducted and the results of the RI.

1.2 Site Background

This subsection describes the site history, its current condition, and the previous investigations performed at the site.

1.2.1 Site Description

The site consists of former waste disposal trenches located on wooded, undeveloped properties and associated groundwater contamination extending into an adjacent residential neighborhood in Byram Township, Sussex County, New Jersey (Figures 1-1 and 1-2). Trichloroethene (TCE) has migrated in groundwater from the source area to nearby residential supply wells at concentrations significantly above background. Cis-1,2-dichloroethene (cis-1,2-DCE) also has been detected in the impacted residential wells.

For the purposes of this investigation, the site has been divided into two operable units (OUs) to address the contamination.

- OU1 addresses the impact of contaminated groundwater to potable wells in the adjacent residential neighborhood in Byram Township.
- OU2 addresses the contamination in and around the former waste disposal trenches and associated groundwater contamination.

This RI is conducted as part of OU2. OU1 has been addressed separately in a focused feasibility study (CDM Smith 2017a).

The OU2 study area is made up of several areas that are defined on Figure 1-2 and include the former dump areas and the residential and drainage areas downgradient that have been impacted by contaminant transport.

Former Dump Areas

The former dump areas were first identified in 2009 by the New Jersey Department of Environmental Protection (NJDEP) during an effort to identify the source of the TCE contamination detected in the nearby residential wells. Subsequent reconnaissance efforts conducted by NJDEP, EPA, and their contractors in December 2009 and May 2010 indicated (Engineering and Environmental Solutions Joint Venture [EES JV] 2016):

- Dump Area A consists of two trenches located on a ridgeline that trends southwest to northeast, directly upslope of and overlooking the Brookwood and Ross Roads neighborhood to the west. The upper trench and lower trench are approximately 120 feet (ft) long and 10 ft wide, with original excavated depths ranging from 3 to 5 ft.
- Dump Area B consists of a trench/low-lying area that is approximately 132 ft long by 15 ft wide and bermed on three sides.
- Dump Area C consists of an open, roughly circular, patch of disturbed vegetation approximately 140 ft in diameter adjacent to Dump Area B.
- Dump Area D is the largest area, consisting of four trenches of varying size (Trench 1 through 4).
- Dump Area E (between Dump Areas B and D) was first observed during EPA's May 2010 reconnaissance. It consisted of four parallel mounds surrounding three trenches in a wooded area between Dump Areas B and D.

Bike Trail

The bike trail is located adjacent to the eastern portion of the former dump areas and supports the movement of recreational users through the area. The bike trail is largely paved or covered with gravel.

Residential Areas

The residential areas located immediately northwest and downhill from the former dump areas, includes residential properties along Brookwood Road and Ross Road.

Drainage Areas

Surface drainage features in vicinity of the site include drainage ditches and two streams; Cowboy Creek and Lubbers Run. Drainage ditches run along both sides of a former railroad bed east of the source areas (Figure 1-2). The drainage ditches flow into Cowboy Creek just north of the source areas. Cowboy Creek then flows westward into Lubbers Run north of the residential areas (Figure 1-1). The northern end of the Cowboy Creek area is bounded by the Byram Township primary and intermediate schools.

1.2.2 Current Site Conditions

Currently, public access to the former source areas is not inhibited by fencing or other measures. A public pedestrian and bicycle path site, which originates at the elementary school to the west of the site, passes directly through the site and continues along the east side of the Cowboy Creek area. Several dirt paths leave this trail and continue up into the upper former dump areas or down into the former railroad bed and the whole area appears to intermittently be used for four-wheeler trails.

The Cowboy Creek area north of the Brookwood Road residences also appears to have limited use as a recreation area as several tree stands were observed in the area.

1.2.3 Site History

TCE was discovered in a private bedrock drinking water well in 2005 during testing associated with a routine real estate transaction. This discovery triggered the Sussex County Division of Health (DOH) and NJDEP to sample approximately 75 private wells in the area from 2005 through 2006. Based on these results, point-of-entry treatment (POET) systems were installed in 18 residences, 17 of which were installed by NJDEP and one installed by a homeowner (EES JV 2016). Further investigations identified potential vapor intrusion concerns and lead to the installation of sub-slab depressurization systems (SSDSs) inside five affected residences (Weston Solutions, Inc. [Weston] 2010). Currently, 19 properties have POET systems installed.

In 2010, in the process of determining a source of the contaminated groundwater, the EPA Environmental Science Division analyzed aerial photography of the site using photographs from 1956, 1959, 1961, 1962, 1963, 1966, 1970, 1973, and 1974. The studies found areas at the property that appeared to have been used for extensive dumping, these areas are now referred to as Dump Areas A through E. Activities began between 1956 and 1959 when the first trenches in Area D were noted. The aerial photography indicates that dumping stopped sometime between 1973 and 1974. The series of photographs shows the development of trenches in Dump Areas A and D. Although no trenches were identified in Dump Areas B, C, and E, all three areas were covered with fill. In total, more than 75,000 square feet (ft^2) was estimated to be covered with fill. The photographs also indicated that a road used to access the railroad tracks is currently part of the Mansfield bike trail and was most likely used to access the site for the dumping (EES JV 2016). The area was owned by a septic disposal company dating to the early 1960s, and the disposed material is believed to be mostly septic waste. Most of the waste disposal appears to have taken place in trenches (Weston 2013). The photographs also indicated the site has not been developed for industrial or other uses.

1.2.4 Previous Investigations

Previous site investigations mainly focused on three site areas: the residential area in the northern portion of the site with groundwater impacted by TCE; the former dump areas, which are identified as the source areas for the groundwater contamination; and the adjacent drainage areas. The work was performed sequentially starting in 2005 by the Sussex County DOH and NJDEP. Figure 1-3 presents a timeline of the investigations performed at the site.

In March 2011, the Mansfield Trail Dump Site was added to the National Priorities List based on the affected residential areas and the Hazard Ranking System results (EES JV 2016), and EPA initiated additional investigation activities.

1.2.4.1 Sussex County DOH Investigations

The Sussex County Department of Health and Human Services and NJDEP first became aware of contamination in May 2005, when TCE concentrations were identified above New Jersey drinking water standard (1 microgram per liter [μg/L]) in residential wells serving homes on Brookwood and Ross Roads.

1.2.4.2 NJDEP Investigations

Residential Area

- NJDEP sampled 75 residential wells in the residential area from 2005 to 2006 and results indicated that 18 of the residential wells were contaminated with TCE at levels above the New Jersey drinking water quality standard with TCE concentrations ranging from 3.9 to 70 μg/L. POET systems were installed in the 18 homes to remove the contamination.

- In April 2006, NJDEP collected a sample from a groundwater seep discharging behind a Brookwood Road home located downslope of Dump Area A. Concentrations of TCE (49.7 μg/L) and cis-1,2-DCE (61.4 μg/L) were detected (Weston 2010).

- From 2006 to 2008, NJDEP collected indoor air and sub-slab soil gas samples from homes throughout the residential area. Results varied, but TCE concentrations above New Jersey State Screening Levels were reported from both sub-slab and indoor air samples, which led to the installation of an SSDS inside five affected residences (Weston 2010).

Former Dump Area Investigations

- The waste disposal trenches were identified in 2009 by NJDEP. The five waste disposal areas (A through E) were identified to be the likely source of downgradient TCE contamination.

- In May 2009, NJDEP installed two shallow bedrock monitoring wells (MW-1 and MW-2) between Dump Areas B and D. The monitoring wells were completed in the fractured bedrock to a depth of approximately 100 ft. In July and October 2009, analytical sampling results NJDEP collected from the wells showed the sum of the detected concentrations of TCE, cis-1,2-DCE, and vinyl chloride in MW-1 ranged from 771 to 835 μg/L, and the sum of the detected concentrations of TCE and cis-1,2-DCE in MW-2 ranged from 1.6 to 9.5 μg/L (Weston 2010).

- In September 2009, NJDEP collected soil samples from Dump Areas A, B, and D. Analytical results indicated the presence of TCE in Dump Area A at a concentration over 20,000 milligrams per kilogram (mg/kg). Soil from Dump Area B was found to contain benzene, toluene, ethylbenzene, and xylene (BTEX) compounds and various other chlorinated benzene compounds. TCE, cis-1,2-DCE, and chlorinated benzene compounds were detected in soil collected from Dump Area D.

Drainage Area Investigations

- In October 2009, NJDEP collected 12 surface water samples from the stream following the railroad bed east of the former dump areas. Volatile organic compounds (VOCs) were not detected for the samples collected downstream of the probable points of entry (PPEs) from Dump Areas B, C, and D. Two samples collected upstream of the PPE contained low concentrations of cis-1,2-DCE. No sediment samples were collected (Weston 2010).

1.2.4.3 Preliminary EPA Investigations and Removal Actions

Residential Area Investigations

- EPA collected 23 residential well water samples in February and March 2010 from 21 residences along Brookwood and Ross Roads and from the Byram Township Intermediate School well (for a total of 24 samples). The sampling was reduced from the original 75 wells NJDEP sampled to focus on the wells where contamination was previously detected.

  Seventeen of the samples were collected from residential wells with POET systems installed. The samples were collected prior to the POET system for these wells, but no port was available prior to chlorine treatment for the school. Six of the well water samples were collected as background locations from residential wells that previous NJDEP sampling indicated had no impact from TCE. These background locations did not have POET systems installed. TCE was detected in 15 of the sampled residential wells serving 56 residents (Weston 2010).

- In October 2011, 30 permanent sub-slab soil probes were installed in residences on Brookwood Road and sub-slab soil gas samples were collected from each probe. The sub-slab soil gas samples were analyzed for chlorinated VOCs (CVOCs): tetrachloroethene (PCE), TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride (EES JV 2016). In March 2012, 17 sub-slab samples, 38 indoor air samples, and 2 outdoor air samples were collected from the same area, and 3 additional permanent sub-slab soil probes were installed (EES JV 2016). Samples were collected using SUMMA canisters and analyzed for the same VOCs as the October 2011 samples. Results of the 2011 and 2012 sampling events are further discussed in Section 4.2.6.

Former Dump Area Investigations

In April 2010, a third shallow bedrock monitoring well, MW-3, was installed in the source areas approximately 1,000 ft south (upgradient) of MW-1. This well was constructed to the same specifications as MW-1 and MW-2 (100 ft into fractured bedrock). Low-flow sampling of the three monitoring wells revealed the presence of TCE in MW-1 and MW-2, but not in MW-3.

In May 2010, EPA surveyed the elevations of MW-1, MW-2, and MW-3; measured water levels; and calculated groundwater elevations in the three wells, which indicated potential for groundwater to flow from south to north. However, flow in the bedrock system is controlled by the orientation of fractures in each area (Weston 2010).

During May and June 2010, soil, groundwater, and composite waste samples, which included almost 100 samples at varying depths throughout the source areas to horizontally delineate soil contaminant boundaries of the dumps, were collected from the site. Analytical results of soil and waste samples indicated the presence of VOCs, such as PCE, TCE, 1,2-DCE, and other chlorinated compounds. Polychlorinated biphenyls (PCBs) also were detected in composite waste samples collected from Dump Areas A, B, and D.

In December 2011, EPA completed the Administrative Record for a time-critical removal action and authorized the mobilization of support equipment by its Emergency and Rapid Response Services (ERRS) contractor to initiate a removal action, including excavating waste materials and contaminated soils from the dump areas.

Former Dump Area Removal Action

Based on soil sample results, which exceeded the NJDEP Site Remediation Soil Cleanup Standards, the EPA ERRS contractor implemented a removal action at Dump Areas A, B, D, and E.

The removal began on February 21, 2012 and concluded on May 30, 2012. During this time, ERRS, with the assistance of the United States Coast Guard Strike Team and Removal Support Team 2, sampled soil to delineate impacted areas and characterize waste, implemented appropriate excavation actions, disposed excavated material in EPA-approved landfills, conducted post-removal confirmation soil sampling, and backfilled and graded each excavation.

Dump Area C was not excavated because the delineation sampling did not reveal contaminant concentrations exceeding NJDEP Site Remediation Soil Cleanup Standards for impact to groundwater. Delineation sampling from the perimeter of Dump Area E also revealed concentrations that were below the action level for the target compound, TCE (1,000 micrograms per kilogram [μg/kg]), and no further excavation was warranted.

Based on the results of the waste characterization sampling, hazardous and non-hazardous materials were separately excavated from the Upper Trench of Dump A, Lower Trench of Dump A, and Dump B. ERRS excavated Dump A (upper and lower trenches) to near bedrock although overburden soil remained in select areas (such as in bedrock cracks and side walls) at thicknesses up to 4 ft in the Lower Trench and up to 3.4 ft in the Upper Trench. Dump B was also excavated to near bedrock although a 3-inch thick overburden soil layer remained between debris/rocks. The excavated soil was separated into hazardous and non-hazardous materials. Trenches 1 through 3 of Dump D were successfully excavated to bedrock, but overburden soil remained in Trench 4 at thicknesses up to 3 ft. All excavated material from Dump D was categorized as non-hazardous material. Dump Area E was used as a staging area for storing separate stockpiles of hazardous and non-hazardous excavated material. Post-excavation soil sampling was conducted at Dump A, B, and Trench 4 of Dump D to confirm that the contaminated soils had been removed. In Dump B, samples were collected from 1 to 3 inches below ground surface (bgs). Areas where post excavation samples had exceeded or were within 10 percent of the 1,000 μg/kg action level for

TCE were excavated to bedrock (including two sampling locations at Dump A and one location at Dump B). After the stockpiled materials were transported and disposed of, the area where the non-hazardous material stockpile was located (in northern portion of Dump Area E) was excavated to bedrock (approximately 2 to 3 ft in depth), and the area where the hazardous material stockpile was located (in the southern portion Dump Area E) was excavated approximately 4 to 7 ft. Excavated soils were removed and disposed of offsite.

Backfilling and grading was conducted with clean excess soils from Dump Areas A and B. From June to July 2012, ERRS contractors completed further site restoration, including improving surface drainage, widening access roads, and hydro-seeding to inhibit erosion (Weston 2013).

1.2.4.4 EPA Initial Remedial Investigation Activities

From August 2013 to December 2015, EPA's contractor, EES JV, performed RI activities at this site. The contractor collected environmental data, including overburden soil samples, subsurface soil samples, rock core samples, groundwater samples, surface water samples, sediment samples, and vapor samples and performed site reconnaissance activities. These results are described in the *Revised Data Evaluation Summary Report (DESR) for the Mansfield Trail Dump Site* (EES JV 2016). The findings of the EES JV investigations have been incorporated into Section 4 of this report, and the DESR is included in Appendix A-1. A summary of the investigations performed is included below.

<u>SOIL INVESTIGATIONS</u>

- Former Dump Area Soils
  - *<u>Field Screening</u>:* EES JV conducted field screening within the source areas and at selected background locations from August to September 2013 to investigate any additional potential contaminant sources or residuals from the dump areas post excavation. The investigation area and sampling locations for the field screening are shown in Figure 3-1 of Appendix A-1 and include the following:
    - *Site reconnaissance/visual inspection across the site grid system within the source areas.*
    - *Collection of surface soil samples (0 to 6 inches deep) from 148 locations for field screening analysis of Target Analyte List (TAL) metals using x-ray fluorescence (XRF).*
    - *Field screening (photoionization detector [PID]) and collection of subsurface soil gas samples (1.5 to 6.0 ft) from 139 locations for VOC analysis.*
  - *<u>Former Dump Area Overburden Soil Investigations</u>:* Based on data from the shallow soil screening, EES JV investigated soil in potential source areas of the site and collected background soil samples in off-site locations from November 2013 to February 2014. The sampling locations are shown in Figure 3-1 of Appendix A-1 and include the following:

- *40 Direct Push Technology (DPT) borings installed across the site until refusal or a maximum depth of 20 ft bgs. Samples were analyzed for VOCs, semi-volatile organic compounds (SVOCs), PCBs, pesticides, and metals (SB01 to SB40).*
- *10 DPT borings installed up to 10 ft bgs at representative background locations. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and metals (BSB-01 to BSB-10). Sampling locations are shown in Figure 3-2 of Appendix A-1.*
- *20 DPT borings using a membrane interface probe (MIP) to screen for VOCs at selected locations based on observations from the previous 40 DPT borings (M01 to M20).*
- *9 surface soil samples at locations inaccessible to drill rigs. Samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and metals (SB41 to SB-49).*
- *10 additional DPT borings at locations where MIP screening data indicated elevated concentrations of VOCs may exist. Samples were analyzed for VOCs (SB50 to SB59).*
- *3 additional rounds of step-out surface soil sampling to delineate contamination found west of the former Dump Area A. Samples were analyzed for pesticides and metals (HA01 to HA28).*

- <u>Residential Area Soils</u>*:* From August to September 2015, borings were installed at 13 locations within the residential area and Byram Township schools to the north to determine the depths and characteristics of the overburden stratigraphy and evaluate the potential for contaminated groundwater in bedrock to migrate upward into the overburden (SB-60 through SB-74, MW-7, and MW-8). Two locations could not be drilled (SB-64 and SB-67) due to utility obstructions and time constraint issues. Soil samples were not collected for laboratory analysis. The groundwater sampling portion is further described under "Groundwater Investigations." Sampling locations are shown in Figure 3-3 of Appendix A-1.

<u>SURFACE WATER/SEDIMENT INVESTIGATIONS</u>

- 10 surface water samples and 12 sediment samples were collected in November 2013 from drainage pathways adjacent to the source areas and in upstream and downstream locations. Co-located samples were collected at locations SW/SED-01 through SW/SED-09. Locations SED-10 through SED-12 did not have enough surface water, so only sediment samples were collected. Sample SW-10 was collected in April 2014 after rainfall to collect water discharging to the adjacent railroad right-of-way through a culvert to confirm previous chromium results found at location SW-07.
- 10 background sediment and surface water samples were collected in November 2013 from upgradient locations and tributaries to Lubbers Run that were not connected to any flow from the site (BSW01/BSED01 through BSW10/BSED10). Surface water was not available at BSED08; thus, only a sediment sample was collected.

All samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and metals. Sampling locations are shown in Figure 3-5 of Appendix A-1.

GROUNDWATER INVESTIGATIONS

Wells installed and/or sampled as part of the EES JV RI investigation are shown on Figure 2-1 of Appendix A-1.

- OVERBURDEN WELL INSTALLATION PROGRAM
  - In March 2014, overburden monitoring wells were installed in the source areas where the shallow aquifer was encountered (MW-4 through MW-6).
  - Off-site overburden wells were installed upgradient of the Byram Township primary and intermediate schools in August 2015 (MW-7 and MW-8, respectively) and in the residential areas in October 2015 (MW-9 through MW-14) based on the overburden and groundwater profiling in the residential areas and schools. Some wells were screened across the water table to evaluate shallow overburden groundwater and potential vapor intrusion impacts. Other wells were screened either just above the competent bedrock or within water-bearing units in the saprolite that were close to competent bedrock. Well construction details (including sampling port intervals) are summarized in Table 3-13 of Appendix A-1.
- BEDROCK WELL INSTALLATION PROGRAM
  - Between December 2013 and September 2014, bedrock boreholes were drilled and bedrock evaluations were conducted for the installation of FLUTe MLS wells (MLS-1 through MLS-9 and MLS-11).
    - *Borehole geophysics logging was conducted at the open bedrock boreholes to identify fractures and other planar features intersecting the boreholes and to identify zones to isolate for packer testing.*
    - *Packer testing was used to assess depth-specific hydrogeology and collect groundwater samples for VOC analysis to help determine the final MLS permanent sample intervals.*
    - *Transmissivity profiling was conducted in the open boreholes MLS-1 and MLS-3. This was done by monitoring the rate of descent of FLUTe liners during the installation. The rate of descent of the liner varies according to the flow rate into fractures, and the plotted descent velocity yielded a relative transmissivity profile for each borehole.*
    - *After NAPL was observed on the geophysical instrument during testing in the MLS-2 borehole, a sample of the NAPL was collected from the FLUTe liner and a grab sample of groundwater was collected from the water table. Both samples were submitted for chemical analysis. The analytical results of the NAPL sampling are provided in Appendix J of the EES JV DESR (Appendix A-1).*
  - In April 2014 and August 2014, three continuously cored bedrock borings were advanced (CB-1 through CB-3). Fifty rock samples were collected for matrix diffusion analysis. An additional six samples were collected for physical property analysis

including total organic carbon (TOC), bulk density, specific gravity, water content, and porosity from CB-1.

- In April 2014 and October 2014, the final sample ports for the 10 MLS wells were selected based on the bedrock evaluations described above, and the wells were installed in accordance with manufacturer specifications. Well construction details (including sampling port intervals) are summarized in Table 3-13 of Appendix A-1.

- GROUNDWATER SAMPLING

  - Groundwater samples were collected during the residential soils investigation for groundwater profiling from August to September 2015, as stated above. Samples collected were analyzed for VOCs, 1,4-dioxane, and total and dissolved metals, if sufficient water was available during boring advancement. However, three borings (SB-60, SB-72, and SB-73) did not encounter groundwater before reaching bedrock and samples from MW-7 and MW-8 were analyzed for VOCs only. The samples and analyses are summarized in Table 3-6 of Appendix A-1.

  - In April 2014, EES JV sampled the three previously installed open-hole bedrock monitoring wells (MW-1, MW-2, and MW-3), three new overburden wells (MW-4, MW-5, and MW-6), and two new MLS bedrock wells (MLS-1 and MLS-3). In November 2014, EES JV sampled the same wells as in April along with the rest of the new MLS wells (MLS-2, MLS-4 through MLS-9, and MLS-11). All samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and total metals. The samples and analyses are summarized in Table 3-7 of Appendix A-1.

  - Overburden wells in the residential area and schools (MW-7 through MW-14) were sampled between September and November 2015. The school wells and one residential well (MW-7, MW-8, and MW-10) were analyzed only for VOCs. The rest of the residential area wells were analyzed for VOCs and SVOCs (MW-9 and MW-11 through MW-14). The samples and analyses are summarized in Table 3-7 of Appendix A-1.

  - In April 2014, EES JV also collected water samples from 16 residential wells that were equipped with POET systems. In November 2014, EES JV resampled 15 of the 16 residential wells that were sampled in April, plus an additional 8 residential wells for a total of 23 locations. All samples were analyzed for VOCs, SVOCs, PCBs, pesticides, and metals. The samples and analyses are summarized in Table 3-8 of Appendix A-1. The sampling locations are shown on Figure 3-4 of Appendix A-1.

  - Three seeps were identified downgradient of the source areas during ecological reconnaissance. Two of them were in a wooded area approximately 500 ft north of the end of Brookwood Road. The third seep was identified as a small groundwater discharge from a fractured bedrock face directly behind a Brookwood Road residence. During the November 2013 surface water and sediment sampling event, only two of the seeps had enough water for sampling: one of the seeps in the wooded area (SEEP01) and the seep behind the Brookwood Road. The samples and analyses are summarized in Table 3-9 of Appendix A. The sampling locations are shown on Figure 3-5 of Appendix A-1.

SUB-SLAB INVESTIGATIONS

EES JV conducted air sampling in January, April, and November 2014 to compare to historical vapor sampling data in the residential area and to reassess conditions at residences that historically had vapor intrusion issues. The January sampling event included 16 residences. However, one of the residences sampled did not have an operational SSDS at the time of sampling, so it was resampled in April 2014 after the system was repaired and reactivated. The November sampling event included 15 residences (same as the January round except for the one that was resampled in April). During each sampling event, sub-slab vapor samples were collected beneath the basement floor of each residence and indoor air samples were collected from both the basement and the first floor. Ambient outside air samples were collected at seven of the residences. All samples were analyzed for VOCs. Samples collected are summarized in Table 3-11 and Figure 3-6 of Appendix A-1.

1.2.5 Summary of Contamination

The following compounds that exceeded screening levels during the previous investigations were considered the primary contaminants of interest. Surface soil and subsurface soil compounds listed reflect conditions investigated after the removal action.

- *Surface soil:* VOCs including 1,4-dichlorobenzene (DCB) and 1,2-DCB, SVOCs primarily polycyclic aromatic hydrocarbons (PAHs), including benzo(a)anthracene and benzo(a)pyrene, pesticides (primarily 4,4’-dichlorodiphenyltrichloroethane [4,4’-DDT]), PCBs (Aroclor 1254 and Aroclor 1260), and metals including lead and mercury

- *Subsurface Soil:* VOCs including 1,4-DCB, TCE, cis-1,2-DCE, vinyl chloride, and chlorobenzene and metals including lead and mercury

- *Groundwater:* VOCs primarily chlorinated ethenes (PCE, TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride) and metals including manganese, iron, and lead

- *Surface Water:* Lead and chromium

- *Sediment:* SVOCs (specifically PAHs) and metals (iron and nickel)

- *Vapors:* TCE, chloroform, benzene, and ethylbenzene

1.3 Report Organization

The RI report is organized as shown below.

Executive Summary – Provides a synopsis of the investigations conducted and their results.

Section 1 Introduction – Presents the objectives of the RI and an overview of the site, including summaries of previous investigations. The organization of the report is presented.

Section 2 Study Area Investigations – Describes the methodology and sampling rationale for the various investigations that were conducted for the RI.

Section 3	Physical Characteristics of the Study Area – Briefly describes the physical attributes of the study area, including surface topography, surface water hydrology, geology, hydrogeology, and meteorology. Sections on demography, land use, and ecology describe the potential populations and habitats for human and ecological receptors.
Section 4	Nature and Extent of Contamination – Lists the screening criteria against which site data were assessed to determine the extent of contamination in soil, groundwater, sediment, and surface water, and describes the type and extent of contamination determined to be present.
Section 5	Contaminant Fate and Transport – Evaluates the persistence and mobility in the environment of the contaminants identified as related to the site and summarizes the fate and transport mechanisms that apply to the site. A CSM discusses the interaction between site conditions, detected contamination, and site receptors.
Section 6	Risk Assessment Summary – Summarizes the results of the human health risk assessment (HHRA) and the screening level ecological risk assessment (SLERA).
Section 7	Conclusions and Recommendations – Presents the conclusions of the RI and recommends future actions.
Section 8	References.

Section 2

Study Area Investigations

This section describes the 2017 and 2018 RI field activities that were conducted in accordance with the EPA-approved final quality assurance project plan (QAPP) (CDM Smith 2017b). Deviations from the QAPP were discussed with EPA and are documented in Field Change Notification forms, which are provided in Appendix B.

2.1 Soil Investigation

Soil sampling was conducted in target areas where surficial runoff has likely mobilized contamination from the former dump areas impacting soils in the residential areas. Figure 2-1 presents the sampling locations, and Table 2-1 presents the details of the sampling event.

Surface soil sampling was performed by hand auger at 12 locations from 0 to 2 ft bgs. Ten surface soil samples were collected in areas of groundwater seepage or surface discharge and in potential runoff collection areas to delineate areas of likely contamination. Soil samples were analyzed for target compound list (TCL) VOCs and selective ion monitoring (SIM) for vinyl chloride, SVOCs, PCBs, pesticides, TAL metals, and mercury.

Two surface soil samples were collected where potential storm drains discharge from the residential areas to the southern end of the Cowboy Creek area. Samples were analyzed for trace-level TCL VOCs and SIM for vinyl chloride, SVOCs, PCBs, pesticides, and TAL metals.

During the 2014/2015 initial RI sampling conducted by EES JV, additional soil samples were collected in the former dump areas (Figure 2-2) and in background areas (Figure 2-3)

2.2 Surface Water and Sediment Investigation

Seeps, springs, and catch basins were sampled within the residential areas downgradient of the former dump areas. The locations of these samples are shown on Figure 2-1. These samples were collected from areas identified during the seep/drainage reconnaissance during a time of high regional groundwater levels. Ten samples were collected for trace-level TCL VOCs and SIM for vinyl chloride. Field parameters also were measured whenever possible (pH, conductivity, temperature, dissolved oxygen, and oxidation-reduction potential [ORP]). Table 2-2 summarizes the sampling event.

Two paired surface water and sediment samples were collected at locations adjacent to the two sets of in-creek and overburden piezometers at Cowboy Creek. The locations are shown on Figure 2-4. Sub-creek bottom groundwater (sometimes referred to as porewater) was collected from the four creek piezometers and shallow groundwater from the two overburden piezometers concurrent with the groundwater sampling described in Section 2.3. This sampling was conducted to provide information to better understand surface water/groundwater interaction (including whether the stream is losing or gaining) at the site and provide additional information about Cowboy Creek.

Surface water and sediment samples were analyzed for TCL VOCs, SVOCs, PCBs, pesticides, and TAL metals. Porewater and shallow groundwater samples were analyzed only for TCL VOCs and hardness to evaluate the impact the CVOC plume may be having on the surface water in the area. Field measurements of pH, conductivity, temperature, dissolved oxygen, and ORP also were collected from the surface water. Table 2-2 summarizes the sampling event.

2.3 Hydrogeological Investigations

Various hydrogeological investigations were performed to more fully characterize the bedrock groundwater flow system and the nature and extent of contamination in site groundwater.

2.3.1 Existing Well Evaluation

CDM Smith assessed the condition of all monitoring wells installed during the previous field investigations to confirm that their condition remains unchanged from the last sampling conducted in November 2014. CDM Smith located each existing well and piezometer, observed and noted the exterior condition of each well, opened the well cap, and measured the depth to water. The water level within the liner of MLS wells also was checked to ensure the installed liners have not leaked. Based on CDM Smith's observations, it was concluded that existing wells did not require re-development.

2.3.2 Borehole Installation and Development

Three MLS-screened wells and two conventional wells (one well pair) were installed in bedrock to provide additional chemistry and hydrogeological information to assist in understanding the nature and extent of the groundwater contamination at the site.

Air rotary drilling was used to advance bedrock monitoring well boreholes to the selected depths. An 8-inch diameter borehole was drilled into the top of the bedrock, and a 6-inch diameter carbon steel casing was grouted in place using cement/bentonite grout. A 6-inch borehole was then advanced to the target depth. CDM Smith monitored drilling progress noting drilling changes, water loss, etc., and logged rock types from the air rotary cuttings.

Following completion, each bedrock borehole was developed to remove fines from the borehole that accumulated during the drilling process. After development was completed, each borehole was lined with a blank FLUTe liner to limit potential vertical contaminant transport within the borehole.

Four boreholes were initially installed, developed, and tested (geophysical/transmissivity and packer testing). One additional borehole was drilled to depth without logging, and a shallow bedrock monitoring well was installed.

2.3.3 Transmissivity Testing, Geophysical Logging, and Packer Testing

Following completion of a borehole, each open borehole was geophysically logged to identify fractures and other planar features intersecting boreholes and to identify zones to isolate for packer testing. The borehole geophysical logs included natural gamma, short and long normal resistivity, single point resistance, spontaneous potential, mechanical caliper, fluid temperature and conductivity, high-resolution acoustic televiewer (ATV) imaging, high-resolution digital color optical video televiewer (OTV) imaging, and heat pulse flowmeter (HPFM) logging under both ambient and pumping conditions. In addition, FLUTe transmissivity profiles were collected at each borehole when the blank liners were removed and re-installed following geophysical logging. The geophysical and FLUTe transmissivity logs are included in Appendix C.

The geophysical and transmissivity data were analyzed by CDM Smith to select packer test intervals and to guide final well screen and multi-level monitoring port depth decisions.

Each borehole was packer tested to assess depth-specific hydrogeology and allow for groundwater sample collection for analysis of trace-level VOCs and SIM for vinyl chloride (48-hour preliminary turnaround). The packer testing results were used in conjunction with the geophysical logs and transmissivity profiling to determine final MLS and conventional well screen intervals. Table 2-3 summarizes the details of the packer testing

At each packer test interval, a packer assembly consisting of top and bottom packers straddling 15 ft of slotted pipe was used to isolate the selected interval. During sampling, water levels were monitored via transducers within, above, and below the packer assembly. At each testing interval, a submersible pump was used to collect a low-flow groundwater sample from the interval. The zone was purged at a rate to allow the drawdown to equilibrate, allowing an assessment of permeability to be made from the data.

2.3.4 Well Installation

Following completion of packer testing, CDM Smith reviewed the data generated and selected final well screen intervals. The well completion information for the new and previously installed multi-port and conventional monitoring wells is summarized on Table 2-4. Newly installed and existing well locations are shown on Figure 2-5. Monitoring well construction diagrams and NJDEP Well Permits are included in Appendix D.

MLS wells were installed per the manufacturer's instructions within the borehole, and port-specific development was completed by purging each port of three well volumes, three separate times before sampling.

Conventional wells were fully developed to remove drilling fluids, silts, and well construction materials from the screen and sand pack and to provide a good hydraulic connection between the well and the aquifer materials. Turbidity, pH, temperature, and conductivity were monitored during development to assess progress. Well development logs are included in Appendix E.

All wells were installed in accordance with New Jersey Administrative Code 7:9D and included surficial completions (stick-up protective casings or flush-mount curb boxes) with locking caps and well identification tags. Subsequent to installation, all new wells were surveyed by Kennon Surveying. Well survey information is included in Table 2-5. In addition to the well survey, Kennon Surveying also performed a site civil, boundary, and topographic survey and created a photogrammetric base map.

2.3.5 Cowboy Creek Piezometers

As shown on Figure 2-5, one shallow piezometer was installed within the upstream portion of Cowboy Creek. The piezometer was constructed of 2-inch diameter polyvinyl chloride pipe connected to a 12-inch long screen with a drive-point tip. The assembly was driven into the streambed, so the screen completely penetrated the sediments at least 12 to 24 inches below the streambed surface.

Two additional shallow piezometers were installed to screen the water table within the overburden immediately upgradient of the creek at two of the existing in-creek piezometer locations. The two overburden piezometers were screened from 3 to 8 ft bgs.

All three piezometers installed were developed to remove fines in the screen and enhance the connection to the aquifer.

Groundwater was collected from the three new piezometers (one in Cowboy Creek and two immediately upgradient of Cowboy Creek) and three old piezometers in conjunction with the groundwater sampling described in Section 2.3.6.

2.3.6 Groundwater Sampling

Three rounds of groundwater samples were collected from site monitoring wells and piezometers: Round 1 included a targeted subset of wells; Round 2 included all existing and new wells, piezometers, and residential wells; and Round 3 included a second sampling event of the new wells and a targeted subset of existing wells.

EPA staff collected Round 1 and Round 2 samples. Round 1 groundwater sampling data was excluded from this RI report due to uncertainties in data quality. Table 2-5 summarizes the number of samples and associated analytical parameters collected for Round 2 and Round 3. Monitoring well locations are shown on Figure 2-5 and residential well locations are shown on Figure 2-6.

The low-flow sampling method was used to sample the wells except for the multi-port wells, which were sampled using typical purge methodology for FLUTe wells. These EPA-approved sampling methodologies are fully detailed in the QAPP (CDM Smith 2017b). Analyses included trace-level TCL VOCs with SIM analysis for vinyl chloride. To support the evaluation of natural attenuation of VOCs in groundwater, select samples also were analyzed for the following parameters (herein referred to as monitored natural attenuation [MNA] parameters): chloride, methane/ethane/ethene, nitrate, nitrite, sulfate, sulfide, ferrous iron, and TOC. Dissolved oxygen, ORP (as Eh), turbidity, temperature, ferrous iron, and conductivity were measured in the field. A flow-through cell was used when measuring oxygen-sensitive field parameters. Details from the sampling events are summarized on Tables 2-6a through 2-6c; water quality parameters collected are summarized on Tables 2-7a and b. Groundwater sampling logs are included in Appendix F.

Samples were also collected for microbial analysis and compound-specific isotope analysis (CSIA). Non-routine analytical services analyses were conducted for the samples below.

- Microbiological Analysis: Twelve samples were collected from monitoring wells and ports within the TCE and DCE plume. Samples were analyzed for bacteria and key functional genes involved in the anaerobic and aerobic degradation of PCE, TCE, cis-1,2-DCE, and vinyl chloride. Results will be used for the evaluation of natural attenuation of the SRCs.

- CSIA: Groundwater samples were collected from 12 wells or well ports in the plume. Samples were collected using the low-flow method. Samples were analyzed for both carbon and chlorine isotopes to document natural attenuation of the SRCs and attempt to determine dominant natural attenuation mechanisms.

2.4 Ecological Characterization

During the sediment sampling event, an abbreviated ecological reconnaissance was performed by a CDM Smith ecologist on November 11, 2017. The reconnaissance, informed by the Information for Planning and Consultation reports provided by EPA, focused on site habitats, both within and near the site, that may be potentially affected by site contaminants.

Observations were made of the vegetation community, wildlife utilization, and contaminant exposure pathways. Habitat conditions were visually inspected by walking the site areas and recording observations of the composition and relative diversity, abundance, and habitat associated with species. Field observations were recorded in logbooks and photographs were taken to document representative and unusual site conditions. Types of information recorded included:

- Vegetation cover types on and in areas immediately adjacent to the site
- Dominant vegetation species and general visual observations of abundance/diversity
- Topographic features (e.g., drainages)
- Location of surface waters and their general aquatic habitat characteristics (e.g., approximate size, flow and direction, bottom substrate, and plant coverage)
- Observations of wildlife use, including (to the extent practicable) species identification and evidence of usage
- Indications of environmental stress that may be related to site contaminants

Results of the ecological investigation are provided in Section 3.8.

Information on state and federally listed threatened, endangered, or rare species was requested from the U.S. Fish and Wildlife Service (USFWS) through EPA Region 2 and the NJDEP Division of Parks and Forestry. The presence state or federally listed threatened or endangered (T&E) species or significant habitats at the site or surrounding area is summarized in Section 3.8.2.

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Section 3

Physical Characteristics of Site

3.1 Topography

The site is located along the spine of a northeast-southwest trending ridge forming the western edge of the drainage basin for Lake Hopatcong. Topography and general drainage pathways are shown on Figure 3-1. The top of the ridge extends to approximately 970 ft above mean sea level (amsl). One of the source areas, Dump Area A, is situated at the top of the ridge. The northwest side of the ridge slopes down to the residential area along Brookwood Road and Ross Road, which is approximately 800 ft amsl. The steepest slopes are located immediately behind the houses on the southeast side of Brookwood Road, where exposed bedrock outcrops are visible. The slope becomes more gradual northwest of the residential area, flattening into the Cowboy Creek area, a wetland/drainage basin with an elevation of approximately 715 ft amsl. Southeast of the ridge crest, the topography quickly drops to a flat area along the ridge at approximately 920 ft amsl. This area contains Dump Areas B, C, and E. Dump Area D extends along the flank of the ridge into the northern portion of the same flat area. The eastern edge of the lower dump areas is bounded by a former railroad bed, which is within a steep, narrow valley more than 50 ft deep.

The former Stanhope-Sparta Road has been converted into a public pedestrian and bicycle path with vehicle access limited by lift gates. The path runs north-south parallel to the former railroad bed and connects to the current road via an overpass in the southern portion of the site. Drainage ditches on either side of the right-of-way flow north to Lubbers Run and ultimately to the Musconetcong River. Bedrock outcrops are located across the site, and the depth to bedrock elsewhere at the site ranges from near-surface to approximately 25 ft bgs. In the residential area north of the site, the bedrock elevation drops almost 300 ft from the ridge north toward Cowboy Creek.

3.2 Surface Water and Drainage

Site surface water bodies and drainage features are presented on Figure 3-1. The closest surface water body to the site is an intermittent stream that flows in a drainage swale within the railroad bed that forms the eastern boundary of the former dump areas. The railroad bed is located within a deep cut (approximately 50 ft bgs), and seepage from the site enters the stream during precipitation and periods of high groundwater levels. The stream flows to the north, and, as the ridge falls away to the north, the stream descends with it, away from the railroad bed. Cowboy Creek enters this area from the east, joining the stream from a culvert under the railroad bed. This confluence, located just north of MW-12, occurs at approximately 770 ft amsl. Cowboy Creek travels northwest in well-defined channel, descending 55 ft to the wetland over a 1,000-foot span. Once in the wetland, Cowboy Creek travels west-southwest as a braided, meandering stream through the flat wetland. It meets its confluence with Lubbers Run after approximately 2,000 ft. This wetland area receives runoff from surrounding hills, including the site ridge to the south.

Lubbers Run flows south-southwest and eventually enters the Musconetcong River, which is a 46-mile-long tributary of the Delaware River.

3.3 Regional Geology and Hydrogeology

The following subsection provides the regional hydrogeologic setting.

3.3.1 Regional Geology

The regional unconsolidated surficial deposits consist of glacial, stream, wetland, hill slope, and weathered bedrock sediments. The glacial sediments were deposited by two glaciations and consist of sand, gravel, silt, and clay laid down by melt water in glacial lakes and river plains; and till laid down by glacial ice as discontinuous sheets on bedrock. Till may be as much as 150 ft thick, but hillside slope deposits are generally less than 20 ft thick. The weathered bedrock generally consists of blocky, sandy silt to silty sand formed by chemical and mechanical decomposition of the underlying bedrock. Bedrock outcrops and thin overburden till exists throughout the regional area (Stanford et al. 1996). The regional surficial geology is shown in Figure 3-2.

The site is in a physiographic province known as the Highlands. The Highlands include rugged terrain and mountainous uplands consisting of erosion-resistant rocks in northeast-southwest trending ridges. The rocks of the Highlands are over one billion years old and once were part of ancient mountain belts (i.e., Appalachian Mountains) formed from colliding tectonic plates.

The site is located within the U.S. Geological Survey (USGS) Stanhope quadrangle. The Stanhope quadrangle is underlain by a variety of Precambrian gneisses and Middle Proterozoic foliated granitoid bedrock. Gneiss is a foliated metamorphic rock consisting of mineral grains with a banded appearance of alternating light- and dark-colored layers. It typically contains abundant quartz or feldspar minerals. The aerially most abundant rocks on the quadrangle are clinopyroxene-bearing syenites and granites, which intruded into the layered gneisses during the Grenville Orogeny (Volkert et al. 1989).

Major northeast trending faults partition the Highlands part of the Stanhope quadrangle into five structural domains. The site lies within the Stanhope domain, which is bounded by the Kennedys thrust fault to the north and Reservoir fault to the south. In addition to these major faults, there are several small faults which are oblique to sub-parallel to the regional structural trend. Folds are a common feature in Paleozoic rocks of the Highlands. The regional bedrock geology is shown in Figure 3-3. This domain's tectonic history formed a joint system of orthogonal joint sets, or intersecting, northeast-southwest striking fractures that dip southeast and northwest. This is consistent with the site's position within the overturned syncline, shown in the regional cross section in Figure 3-3.

3.3.2 Regional Hydrogeology

Regional groundwater flows to the northwest. The surficial glacial deposits can contain groundwater sufficient for domestic and public supply wells and several public water supply systems exist within a 5-mile radius of the impacted residential community. The nearest public water supply is operated by East Brookwood Estates Property Owners Association, Inc. and is located less than a mile to the west. Other local public water supply systems include Stanhope Water, Brookwood Musconetcong River Property Owners Association (West Brookwood), Strawberry Point Property Owners Association, North Shore Water Association, Frenches Grove

Water Association, Willor Manor Water Company, Sparta Water Company, and Forest Lakes Water Company.

Many of these well systems draw from the surficial glacial deposits. For instance, wells at the north end of Budd Lake draw water from Illinoian and late Wisconsinan glaciolacustrine sand and gravel units. Sandy till associated with terminal moraine also supplies a few domestic wells and public supply wells in the Netcong well field. The valley fill sediments also provide storage and recharge for the underlying bedrock aquifers. The gneiss and carbonate rock aquifers are tapped by Stanhope and Netcong well fields.

3.4 Site Hydrogeologic Framework

3.4.1 Overburden

Overburden deposits cover the entire site, except on the steep northwest face of the ridge and in the former railroad bed where bedrock outcrops.

3.4.1.1 Lithology

Figure 3-2 presents the regional surficial geology map. The surficial deposits at the site have been mapped as the Netcong Till (Qn, till sheets, and Qnt, discontinuous till less than 20 ft thick). This glacial till is a yellowish-brown, poorly sorted, poorly stratified silty sand with 10 to 40 percent by volume pebbles and cobbles and 5 to 10 percent by volume boulders (Stanford et al. 1996). The depositional environment is interpreted to be proglacial, likely deposits associated with drumlins, moraines, and glacier runoff. In the low-lying area southeast of the ridge, near Dump Areas, B, C, D, and E, swamp deposits have been identified. Fluvial deposits are present in the Cowboy Creek area.

Overburden soils were logged as part of direct-push investigations performed during the 2014/2015 initial RI field investigations, respectively. Additional soil observations are available from bedrock drilling. Overburden characteristics based on these observations are described below.

Most of the overburden encountered during drilling consisted of a non-stratified, loose, dry brown to gray sand/silt mix with varied amounts of gravel and cobbles. This material was encountered in the background soil borings to the south and southeast of the waste areas (BSB-01 through BSB-04) and to the north (BSB-05) (Figure 2-2). Similar material also was encountered within and around the waste areas. Although the material in the waste areas appears similar to local background soils, it likely represents locally imported fill.

Borings in areas of thicker overburden (from the center of Dump Area E south to SB-29) at the site did encounter a wider range of material, as described below.

- A dense, brown to gray clay/silt unit with few gravel fragments was encountered generally below 5 ft bgs. This unit appears to represent native material, as it was primarily encountered east and south of Dump Area E.

- Borings installed below the clay/sand unit encountered a distinctive, extremely dense gray-green sand with little to no fines that was generally encountered at more than 10 ft bgs and was always saturated.
- Peat and/or organic silts were associated with relatively shallow material (generally less than 5 ft bgs) in the low-lying wet from the center of Dump Area E to the south. The organics appeared to pinch out to the southeast from SB-18 to SB-19 and SB-29 and correlate with the area of swamp deposits (Qs) identified by Stanford et al. (1996). These were described as gray silt and clay with organic matter, overlaid by dark brown and black peat.
- The shallow overburden to the north and west of Brookwood Road (such as that encountered in SB-65, SB-68, and MW-14) closer to Cowboy Creek included several feet of organic-rich silts.

The overburden is relatively thin (less than 5 ft thick) along the top and flanks of the ridge. Overburden thickness generally increases in the flat areas to the southeast of the ridge (Figure 3-4) within the source area. The thickest overburden within the source area is in the southern portion of Dump Area E. The overburden thins to the southeast of Dump Area C; this trend appears to continue within the depression southwest of Dump Area C, but drill rigs could not access this area because of standing water. In the residential area northwest of the ridge, the overburden thickness increases north of Brookwood Road as the bedrock drops away from the ridge. These trends are presented in geologic cross section A-A', presented from southeast to northwest (Figure 3-5a). Cross section B-B' (Figure 3-5b) is oriented from southwest to northeast. Cross sections A-A' and B-B' are oriented, respectively, subparallel to the dip azimuth and strike, of the Category 1 and 2 transmissive features discussed in Section 3.4.2.3. Cross section locations are presented on Figure 3-1. Surface geophysical studies conducted in the residential area (included in Appendix A-1 – DESR Appendix D) were compared to collocated borings to aid in the understanding of overburden thickness in this area. The surface geophysics confirmed the presence of overburden in the residential area, ranging from being non-existent where it pinches out at the slope to approximately 40 ft thick along Line 1 (along the back of the southern properties on Brookwood Road). The surface geophysics also illustrate the undulating surface of the bedrock and complex nature of the overburden material. The transects show multiple high angle fractures, weathered and water-bearing zones, and the bedrock surface daylighting at the east end of Brookwood road near MLS-13 and directly up the slope, or southeast of Brookwood Road.

The overburden encountered in the eastern portion of the residential area (close to the end of Brookwood Road) was similar to the overburden in the source area. However, starting close to the eastern end of Ross Road and proceeding westward, away from the source area, the borings encountered a thick layer of apparent saprolite, or extremely weathered, friable rock. The material also may be partially lithified sediment. The saprolite consisted of layers of well cemented (sandstone-like) to poorly cemented (loose) material with grain size ranging from silt to coarse sand. The more cemented material appeared to be thick layers (5 or more ft thick) rather than boulders because of the horizontal layers within this material. Most of the material was dry/dusty (and more lithified units were noted to be "bone dry", but a few layers were water-bearing. The material tended to become more competent with depth, and competent bedrock was determined based on encountering either granite/syenite or several feet of completely lithified (unbreakable) core. The increased thickness of this weathered material is apparent in Line 1 of the surface geophysics, west of MLS-9, where a more than 50-foot-thick low resistivity zone is present below 20 to 40 ft of overburden.

3.4.2 Bedrock

3.4.2.1 Bedrock Surface

Bedrock outcrops are located across the site, and the depth to bedrock elsewhere at the site ranges from near-surface to approximately 25 ft bgs. In the residential area north of the site, the bedrock elevation drops almost 300 ft from the ridge north toward Cowboy Creek.

The DPT and groundwater profiling depths, supplemented with bedrock drilling data, were used to generate a bedrock surface topography map for the source area (Figure 3-6). This figure illustrates a high elevation near excavation Area A along the south-southwest to north-northeast trending bedrock ridge and sloping down approximately 40 ft to the flatter areas around Excavation Areas B, D, and E. A bedrock depression is apparent near the south end of Excavation Area E where overburden is over 20 ft thick. The bedrock surface in the source area was observed during the excavation activities in 2012 as being uneven and fractured, with post excavation confirmation samples being collected from bedrock cracks in the surface (Weston 2013). The upper 5 to 10 ft of the bedrock is extremely weathered, fractured, and unstable, as evidenced by drilling notes and casing depths. This zone however was not characterized in as much detail as the overburden or competent bedrock since DPT borings did not advance this deep and coring began at the bottom of this unit since it was cased off. The weathered zone is mapped in cross sections (Figures 3-5a and 3-5b). These cross sections present how the weathered zone is thin in the source area, where the overburden is thick, and is thicker on the ridge.

Figure 3-6 also includes the approximate bedrock topography for the residential area and Cowboy Creek area in addition to the source area. The contours in this figure were developed using the site Leapfrog Works three-dimensional model to interpolate depth to bedrock data from borings from the groundwater profiling and overburden well installation in addition to bedrock depths based on the observations from MLS well drilling, and available bedrock depths from residential water supply wells. The weathered, fractured nature of the bedrock surface is apparent in the surface geophysical data where the contact between overburden and bedrock is transitional, with resistivity values rising gradually with depth between the two units. The mapped bedrock surface is uneven and underlies discontinuous blocks of high resistivity and zones of low resistivity, which are categorized as porous and/or water-bearing zones. The bedrock surface is extremely steep from the flank of the ridge to the north side of Brookwood Road and flattens out toward the Byram Township schools (MW-07 and MW-08). The elevation of the bedrock at MLS-14, at the schools, is 15 ft higher than at MLS-11.

3.4.2.2 Bedrock Lithology

The site is underlain by Proterozoic age gneiss (Losee Gneiss) and pyroxene syenite bedrock. The Losee Gneiss is described as medium-fine to medium-coarse grained and weakly foliated, with foliations trending southwest to northeast. The gneiss and pyroxene syenite are part of the Hopatcong Intrusive Suite. (Volkert et al. 1989). The bedrock surface generally mirrors the topography at the site and is exposed in numerous locations along the ridge the former dump areas occupy.

Continuous rock cores were collected from three boreholes in the source area (CB-1 through CB-3) at 222, 68, and 102 ft bgs, respectively; these cores provided detailed information on bedrock lithology and structures. Lithology evaluation was based on observations of drill rig advancement (i.e., “soft” zones indicating potential fractures), changes in wash water/dust color, visual inspection of cuttings, and other observations. Borehole geophysics also were used to evaluate bedrock structure and lithology.

The rock logged appeared to be a quartz- rich syenite. Grain size varied at irregular intervals from medium sand-sized to distinct crystals greater than 4 centimeters (cm). Several zones had breccia-like texture, with jagged clasts in finer-grained material and healed fractures. Predominant minerals were pink potassium feldspar, followed by quartz, plagioclase, and dark minerals (possible pyroxene and magnetite). The dark minerals were generally extremely fine-grained and generally magnetic. Large areas of dark minerals often contained pyrite crystals, some up to 1 cm in diameter. Some of the dark grains may have included hornblende. Micaceous grains (such as biotite) were not observed. The rock was extremely hard, and outside of rubble/weathered zones, took significant effort to break with a hammer and chisel, even along foliations and veins. The upper 50 ft was described as containing a higher incidence of fractures and weathered material, with edges stained brown, black, and green. In MLS-11, in the Cowboy Creek area, the drilling cuttings were described as severely weathered from the bedrock surface to below 80 ft bgs. This location is consistent with the saprolite described in Section 3.5.1.1 in the eastern portion of the residential and Cowboy Creek areas. Zones with finer grains and more dark minerals tended to be very slightly foliated, with near-horizontal foliation. Veins tended to be filled in with a distinct light green-yellow massive material identified as epidote. These green veins were generally high-angle and cross-cut foliation. There did not appear to be consistent changes in mineralogy with depth.

3.4.2.3 Identification of Transmissive Features in the Bedrock

During the matrix diffusion study discussed in Section 4.2.3, the primary porosity of rock core samples was analyzed and found to range from 0.01 to 0.07 percent (Appendix A-1, DESR Appendix F). Because of the low primary porosity, groundwater flow is primarily in the secondary porosity of the rock which is formed by the weathered zone in the shallow bedrock and by features (e.g., bedding planes and fractures) in the bedrock. Fractures are typically caused by tectonic forces. Therefore, obtaining data on the extent, orientation, and transmissivity of these features is necessary to understand the bedrock hydrogeology and groundwater flow direction.

The depth of the weathered zone in the bedrock, the orientation of features in the bedrock, and their transmissivity were obtained by analyzing rock core (collected at three borings), from borehole geophysical logs, FLUTe transmissivity profiles, and packer tests (see Section 2.3.3 for details on these procedures). In addition, synoptic water level elevation data were used to assess horizontal and vertical changes in hydrogeology. Rock core logs are provided in Appendix A-1 - DESR Appendix C. The borehole geophysics logs for the open bedrock boreholes (MW-1, MW-2, MLS-1 through MLS-9, and MLS-11, MLS-12 [MW-16], MLS-13, MLS-14, MW-15D) are provided in Appendix C-1.

Inspection of the core from locations CB-1, CB-2, and CB-3 showed that fracture dips ranged between 45 degrees (°) and 75°. In the upper 30 ft or so of rock core, fractures surfaces were stained reddish-brown to black, indicating oxidation, due to weathering. However, most of the fracture surfaces below about 30 ft had a splotchy light green/dark green to green-blue growth. Slickensides, due to movement along a fault, were visible on a few fracture surfaces. Some of the material on the fracture surfaces reacted to hydrochloric acid indicating it is calcite or a similar carbonate mineral. Few natural fractures were encountered in the core below 160 ft bgs. Several rubble zones were identified, indicating intersecting fractures or zones of potential weakness. Boring CB-3, located at the ridge top, had much more extensive rubble zones than the other two borings. During drilling at boring CB-1 an apparent void was encountered from 108 to 110 ft bgs. The rest of this core interval had poor recovery; only 2.5 ft of core was retrieved from 106-116 ft bgs. The observations of changes in drilling and fluid loss or gain made during drilling and rock coring were included in the logs with the geophysical data to facilitate the analysis of bedrock hydrogeology (Appendix A-1 - DESR Appendix D).

The geophysical subcontractor identified features in the OTV and ATV logs from the MLS well boreholes and classified them from most open to least open, based on the visible appearance of the aperture on the borehole wall, as "fractures," "hairline fractures," "discontinuous fractures," "discontinuous hairline fractures." They also identified "bedding planes/changes in lithology" (Table 3-1). The contractor identified 1,771 features which breakdown as follows based on their classification:

- Fractures: 39 features, 2.2 percent
- Hairline fractures: 493, 27.8 percent
- Discontinuous fracture/fracture/feature: 2, 0.1 percent
- Discontinuous hairline fracture/feature: 835, 47 percent
- Bedding planes/changes in lithology: 402, 23 percent

Note that borehole geophysical logging was performed within the liner installed in the MLS-2 boring and therefore only a limited suite of tools was used (e.g., the ATV was used because sound waves can penetrate the liner but not the OTV because it uses visible light).

To identify those features controlling groundwater flow for further analysis, the data from the borehole geophysical logs, FLUTe transmissivity profiles, and packer tests were used by CDM Smith to classify fractures and features according to their relative transmissivity (Table 3-1):

- Category 1 = "Transmissive" features based on multiple lines of evidence of transmissivity, 69 features, 4 percent
- Category 2 = "Potentially transmissive" features based on limited or conflicting evidence of transmissivity, 634 features, 35.8 percent

- Category 3 = "Not transmissive" features showed no evidence of transmissivity in the available dataset. The transmissivity of these features may be very low. 1,068 features, 60.3 percent

To assess the vertical distribution of the Category 1 or Category 2 transmissive features, the feature density was calculated at 20-foot intervals and is presented in Table 3-2. The data in this table show that, in general, the transmissive fractures occur at a frequency of less than one fracture every 2 ft and the highest density of transmissive fractures occurs in the upper 100 ft of each boring.

To determine the orientation of features in the bedrock, a series of stereonets were prepared using the orientation data, i.e., dip azimuth and dip angle, of the features identified in Table 3-1. The stereonets were prepared using a lower hemisphere Schmidt net projection in the stereonet utility in Rockworks software (Version 17). Each feature is represented a pole to a plane which appears as a point on the stereonet. The points then were contoured to show density.

The stereonet shown in Figure 3-7(a) was prepared using all the features listed in Table 3-1 and shows features in two clusters: one cluster in the northwest quadrant dipping generally to the southeast at a dip angle of 45 degrees; and a second cluster of features in the southeast quadrant dipping generally to the west-northwest at a dip angle of about 55 degrees.

The stereonet shown in Figure 3-7(b) was prepared using only the features classified as "bedding/change in lithology". These features are clustered in the northwest quadrant, indicating features dipping generally to the southeast at a dip angle of 45 degrees.

The stereonet shown in Figure 3-7(c) was prepared using only the features classified as Category 1 transmissive features by CDM Smith. These features are the most significant water-bearing features in the bedrock underlying the site and downgradient areas. The stereonet shows features in two clusters: one cluster in the northwest quadrant dipping generally to the east-southeast at a dip angle of 45 degrees and an orthogonal set of features clustered in the southeast quadrant dipping to the west-northwest at a dip angle of 40 to 50 degrees. The transmissive nature and orientation of these features provides a pathway for groundwater flow to the west-northwest, from the source area toward the residential area, and to the north-northeast along strike.

The stereonet shown in Figure 3-7(d) was prepared using only the Category 2 transmissive features classified by CDM Smith. These features contribute to the secondary porosity in the bedrock. These features are more numerous that then the Category 1 features but have the same basic orientation as the Category 1 features shown in Figure 3-7(c) and discussed above, i.e., an orthogonal set of features dipping west-northwest and east-southeast and striking north-northwest/south-southwest. The common orientation of the Category 1 and 2 features is shown in the stereonet in Figure 3-7(e) where they are plotted together.

The stereonet shown in Figure 3-7(f) was prepared using only the features classified as Category 3 features by CDM Smith. These features are judged by CDM Smith to not be transmissive based on the available data. This stereonet shows features in two clusters: one cluster in the northwest quadrant dipping generally to the southeast at a dip angle of 45 degrees; and a second cluster of features the southeast quadrant dipping generally to the west-northwest at a dip angle of about 55 degrees.

Surface geophysics (included in Appendix A-2 – DESR Appendix D) identified potential shallow bedrock fractures in the residential neighborhood north of the ridge. The primary fracture sets are oriented roughly parallel to geologic cross section A-A' (Figure 3-5a). Cross section B-B' is oriented subparallel to the fracture set strike. Soil profiling location SB-71 and monitoring well MW-10 were intended to target this location.

3.4.3 Bedrock Hydraulic Conductivity and Transmissivity

Hydraulic Conductivity

The previous investigation estimated the hydraulic conductivity of the fractured bedrock ranged from 10^{-6} (1 in one million) to 10^{-4} (1 in 10,000) centimeters per second (cm/s), or about 0.003 to 0.3 foot per day (ft/day) (EES JV 2016).

The hydraulic conductivity was estimated during packer testing and was assumed to correspond to each 15-foot packer zone, although it is likely that multiple fractures provided the groundwater flux. The wide variance in hydraulic conductivity calculated from packer testing represents the fracture-dominated bedrock flow. Packer test results are described in Appendix C-3 and summarized in Table 3-3. The hydraulic conductivity of the bedrock as calculated from packer test data ranges from less than 0.001 ft/day (MLS-3, 95 to 110 ft bgs) to 23 ft/day (MLS-11, 100 to 115 ft bgs). This highest hydraulic conductivity converts to a transmissivity of 345 ft^2/day.

Transmissivity

Transmissivity profiling was conducted in boreholes MLS-1, MLS-3, MLS-5, MLS-6, MLS-7, MLS-12, MLS-13, and MLS-14 as discussed in Section 2.3.3. Transmissivity profiling results are described in Appendix C-2. The profiling produced a high-resolution log of transmissivity at discrete intervals, down to the depth of the log, which was typically above the bottom of the borehole due to the rate of profiling decreasing as shallower transmissive features are closed off. The FLUTe results were compared to packer testing results, HPFM data, and other borehole geophysics data to identify transmissive features and zones.

Calculated transmissivity values ranged from less than the detection limit to 371 ft^2/day (MLS-6 at 335 and 336 ft bgs. Generally, the FLUTe transmissivity profiling agreed with packer testing results. For example, profiling in MLS-3 indicated sporadic transmissive zones from 170 to 191 ft bgs, which falls within two packer zones: 165 to 180 and 180 to 205 ft bgs, which were transmissive. Some packer test zones, such as MLS-3 from 240 to 255 ft bgs, were found to have almost all transmissivity coming from one feature, identified as a low-angle fracture at 256 ft bgs via ATV and confirmed with the FLUTe transmissivity profile. Other zones, such as in MLS-4 from 285 to 300 ft bgs had a transmissivity of 4.35 ft^2/day, but no dominating feature. Instead, 11 minor features throughout the interval produced the transmissivity and were confirmed via a consistent set of small peaks on the FLUTe transmissivity profile. The circumstance where the FLUTe transmissivity profile differed most from other lines of evidence was in the deep intervals in MLS-1 and MLS-12 that proved to be transmissive through packer testing, but where the FLUTe liner stopped falling due to low transmissivity in the open portion of the borehole. These differences are expected, given that the packer testing measured bulk hydraulic conductivity/transmissivity over a 15-foot interval and the transmissivity profiling provided point measurements. Many packer zones had some degree of leakage during testing, which is consistent by the high degree of fracturing and interconnected fractures identified in the boreholes.

Given the variance involved in determining the "true" static water level, potential variations in pumping rates, and potential for leakage, the hydraulic conductivity and transmissivity values from the packer tests should be considered order of magnitude estimates. The uppermost, weathered bedrock, which was cased off to seal the bedrock borehole, would be expected to have a higher hydraulic conductivity. The wide variance in hydraulic conductivity calculated from packer testing represents the fracture-dominated bedrock flow.

3.5 Site Hydrogeology

3.5.1 Conceptual Groundwater Flow Model

The hydrogeologic data discussed in Sections 3.4.1, 3.4.2, and 3.4.3 were used to define the conceptual groundwater flow model as follows:

Groundwater Zones

- ***Overburden*** – In the source area, the saturated zones in the overburden are discontinuous and limited to the lower dump areas between the ridge and the former railroad bed. The overburden also underlies the residential and Cowboy Creek areas northwest of Brookwood Road and north of well MLS-13 (Figure 3-4). At other locations at the site, the overburden is unsaturated because infiltrating rainwater drains into the underlying bedrock surface. Water depths in the overburden range from just below the ground surface in the Cowboy Creek area to greater than the full thickness of the overburden in parts of the source area where the water table lies below the overburden during dry periods. The thickest unsaturated overburden is found in the area of MLS-5 (15 ft).

- Bedrock – The bedrock was separated into three zones to facilitate discussion of flow within the fractured bedrock. Data on the extent, orientation, and transmissivity of fractures were considered in defining these zones, but they should not be considered separate units as flow can move through high angle fractures that cross connect the zones.

    - ***Shallow bedrock*** – This zone is present on the ridge underlying the upper and lower dump areas (the source area), is in the elevation range of 800 to 900 ft amsl, and pinches out to the west toward the residential area and Cowboy Creek as the surface topography drops below these elevations. The shallow bedrock zone is defined, as shown in cross sections A-A' and B-B' (Figures 3-5a and 3-5b), by a higher density of transmissive or potentially transmissive fractures in the upper 100 ft of each borehole in the source area. This zone is fully saturated except for the northern source area (MLS-2, MLS-5, and MLS-7) where the water table ranged from 24.9 to 42.5 ft bgs in January 2018.

    - ***Intermediate bedrock*** – This zone underlies the shallow bedrock zone, occurs in the elevation range of 650 to 800 ft amsl, and pinches out to the west toward Cowboy Creek as the surface topography drops below these elevations. The intermediate bedrock

CDM Smith

zone is characterized by fewer transmissive or potentially transmissive fractures than the shallow and deep bedrock zones.

- ***Deep bedrock*** – This zone underlies the intermediate bedrock zone, occurs in the elevation range of 500 to 650 ft amsl, is laterally continuous from beneath the source area to the west toward Cowboy Creek, and is defined by higher concentration of transmissive fractures than the intermediate bedrock zone. The deep bedrock zone provides a pathway for groundwater to move horizontally from beneath the source areas toward Cowboy Creek.

Groundwater Flow

The conceptual groundwater flow model is illustrated on cross sections A-A' and B-B' (Figures 3-5a and 3-5b). Cross section A-A' is oriented northwest/southeast, which is subparallel to the dip azimuth of the transmissive and potentially transmissive fractures, and cross section B-B' is oriented subparallel to the strike of these fractures as discussed in Section 3.4.2.3.

In this conceptual model groundwater flows from the top of the ridge toward Cowboy Creek, as illustrated with blue arrows on cross section A-A', as follows (Figure 3-5a):

- Precipitation enters the overburden at the top of the ridge (the source areas), flows down through the vadose zone in the shallow bedrock, and enters the saturated zone.
- From this high point in the groundwater flow system, some groundwater flows down the dip azimuth of the northwest set of transmissive features, some groundwater flows down the dip azimuth of the southeast set of transmissive features, and some groundwater flows directly into the deeper bedrock.
- Groundwater flows under unconfined conditions downward and to the northwest from the shallow zone into the intermediate zone or discharges to seeps along the bedrock cliff face. Once in the intermediate zone, groundwater becomes restricted to fractures and flows under confined conditions. Some of the flow in the intermediate zone discharges to the overburden, between wells MLS-9 and MLS-11, and some of the flow moves more vertically, entering the deep zone through high angle fractures. In the deep zone, groundwater continues to flow under confined conditions to the northwest toward the Cowboy Creek area. In the vicinity of MLS-14, deep groundwater flow is expected to be minimal based on the lack of transmissive fractures below 525 ft amsl and the low hydraulic gradient.
- There is a strong downward gradient in the wells completed in the ridge, i.e., MLS-3 and MLS-4. The downward gradient decreases from well MLS-3, to well MLS-9, to well MLS-11, and is smallest at well MLS-14.

Groundwater in the conceptual model also flows from the top of the ridge toward the northeast as illustrated on cross section B-B’, as follows (Figure 3-5b):

- Precipitation enters the overburden at the top of the ridge, including Dump Area D, flows down through the vadose zone in the shallow bedrock, and enters the saturated zone in the shallow bedrock.

- Under the influence of a strong horizontal gradient, groundwater flows north in the shallow bedrock, transitions to the intermediate zone, and discharge to the overburden near well MW-12.
- There is a vertical downward gradient at well MLS-1 from the shallow, to the intermediate, and then to the deep zone. Moving to the north, at wells MLS-6 and MLS-5, there is a downward gradient from the shallow to the intermediate zone and an upward gradient from the deep to the intermediate zone. Moving further to the north (at MLS-7 and MLS-2), there is an upward gradient from the deep zone to the intermediate and shallow zones. Similar to the primary flow direction illustrated in cross section A-A', shallow groundwater flows under unconfined conditions along cross section B-B'. However, once in the intermediate zone, flow remains unconfined, moving north and upward. Finally, at well MLS-13, a downward gradient is present from the shallow zone to the intermediate and deep zones.
- In the deep zone, groundwater flows to the north toward the Cowboy Creek area.

The residential wells are expected to have some influence on the natural groundwater flow system described above, as follows:

- Much like the high angle fractures encountered, residential wells, such as BYR-DW124 and BYR-DW120, are open boreholes providing a vertical conduit for groundwater migrating from the source area to mix and move vertically into the deeper bedrock. Based on the observations obtained during geophysical logging, downward vertical fluid movement would be expected to occur under ambient conditions (i.e., with the pump off) and would be increased by pumping.

Groundwater flow and vertical gradients are discussed in detail in the following sections.

3.5.2 Overburden

The presence of saturated zones within the overburden is discontinuous across the site. It is limited to the flat area that makes up the lower dump areas and in the residential area and Cowboy Creek area northwest of Brookwood Road. At other locations in the former dump areas, the overburden is unsaturated and merely acts as a conduit for infiltrating rainwater to find fractures within the bedrock surface.

3.5.2.1 Source Area

The saturated portion of the overburden in the source area is limited to the flat area near Dump Areas B, C, and E (Figure 3-4) as defined by monitoring wells: MW-4, MW-5, and MW-6. (MW-4 and MW-6 are screened from 10 to 20 ft bgs and MW-5 is screened from 5 to 10 ft bgs). Groundwater recharge to these wells was adequate during well development activities but water levels have fluctuated with precipitation.

Water levels were measured in the source area overburden monitoring wells in May 2014, November 2014, December 2015, and January 2018. Water levels are tabulated in Table 3-4. A basic triangulation of the water level elevation data in these wells indicates groundwater in the overburden flows to the east, opposite of the regional groundwater flow direction. Horizontal hydraulic gradients were not calculated for the source area, given the small number of data points available for this area. The extent of the saturated overburden in the source area has not been fully delineated and appears to vary depending on the water level in this unit. For example, as shown in Figure 3-4, in December 2015 the saturated overburden covered approximately the southern end of Dump Area E. During January 2018, the saturated overburden had expanded to include the area defined by Dump Areas B, C, and E. The increase in size may be the result of a rain and snowmelt event just prior to the measurements in January 2018 (Table 3-5). The saturated overburden zone also generally coincides with where overburden is greater than 10 ft thick.

The hydraulic conductivity of non-cohesive glacial till deposits, such as those encountered in the central portion of the site coinciding with low-lying area/bedrock depression, may be estimated at approximately 10^{-4} cm/s; however, site-specific values for overburden hydraulic conductivity have not been determined.

3.5.2.2 Residential Area

Some groundwater flowing along the bedrock topography to the north, or migrating laterally through bedrock, daylights in the residential area as bedrock seeps. Multiple seeps were sampled from the outcrops southeast of Brookwood and Ross Roads in 2017 (Figure 2-4). The saturated overburden north-northwest of the site begins in the residential area. The bedrock and ground surface elevations drop significantly to the northwest of Brookwood Road, and the overburden thickens to the northwest from its emergence at Brookwood Road, becoming saturated closer to ground surface, with the water table eventually converging with the ground surface in the Cowboy Creek area wetland.

Within the residential neighborhood and the wooded area to the north, groundwater flow is to the north and northwest toward Cowboy Creek and the associated wetland. Groundwater flow north of Cowboy Creek (MW-07 and MW-08) is toward the southwest and the creek (Figure 3-9).

3.5.2.3 Cowboy Creek Area

Cowboy Creek and the wooded area north of Brookwood Road receive runoff from the surrounding hills including the ridge, to the east, where the source areas are located. The overburden in the Cowboy Creek valley is significantly thicker (up to 50 ft at MW-08) than on the site ridge where the overburden pinches out to a bedrock outcrop at Brookwood Road, so the saturated overburden in this area has a greater capacity to store runoff and groundwater infiltration. The horizontal gradient of the saturated overburden in the Cowboy Creek area lessens as the potentiometric surface flattens from the residential area into the wetland (Figure 3-9). The horizontal gradient was calculated at 0.002 ft/ft from MW-14, northwest of the residential area to MW-8 at the school.

In December 2015, the piezometers at Cowboy Creek showed small differences in water levels between the surface water and groundwater immediately below the streambed, see Table 3-6a, with the largest difference (approximately 0.1 foot) at PZ-1. The measurements suggest recharge potential from the stream to the overburden at PZ-04, and potential for discharge of groundwater into the stream at PZ-01. PZ-02 and PZ-03 within the ponded area do not show a distinct trend. The profile of the stream coming from an elevated area to the east, as a losing stream at PZ-04 and then entering the low area/wetland beginning at PZ-01, where it appears to be gaining makes sense as the overburden groundwater and wetland areas are interconnected.

3.5.3 Bedrock

3.5.3.1 Bedrock Vadose Zone and Recharge from Overburden

At well locations MLS-3 and MLS-4, near the peak of the ridge and near Dump Area A, a vadose zone is present in the bedrock. This zone was observed during borehole geophysical logging and confirmed by water level elevation data observations after installation of the multi-level wells. During geophysical logging, the vadose zone was observed during HPFM logging at MLS-4 where the ambient log showed down flow of 0.46 gallons per minute (gpm) in the shallowest reading collected just below the static water level in the well. This observation indicated that fractures in the open borehole between the bottom of the casing at 12 ft bgs and the static water level at 68 ft contributed 0.46 gpm of flow into the borehole.

Groundwater is moving along strike to the northeast and downward along dip to the northwest and to the southeast. To the northwest of MLS-3 and MLS-4, groundwater discharges from bedrock at seeps in the bedrock outcrop behind the houses along Brookwood Road. To the southeast of MLS-3 and MLS-4, groundwater discharges from bedrock at seeps along the former railroad bed.

Groundwater moves downward along fractures through the vadose zone and into the shallow bedrock near wells MLS-3 and MLS-4. Below approximately 100 ft bgs, near these wells, the bedrock becomes less fractured and less transmissive. This decrease in transmissivity creates differences of about 40 ft in water level elevation between the shallower and deeper ports in wells MLS-3 and MLS-4. In well MLS-3 the water level elevation in the first port, in the shallow bedrock, was 921.61 ft amsl and the water level elevation in the second port was 880.69 ft amsl, or 40.92 ft lower. In well MLS-4 the water level elevation in the first and second ports, in the shallow bedrock, were 921.33 and 921.30 ft amsl, respectively, and the water level elevation in the third port was 882.14 ft amsl, or 39.16 ft lower. These observations of vertical changes in transmissivity and water level elevation were used to help define the shallow and intermediate bedrock hydrostratigraphic units (Figure 3-5a).

3.5.3.2 Bedrock Potentiometric Surfaces and Flow

The orientation of the transmissive features in the bedrock, discussed in Section 3.4.2.3, at the site strongly influences the direction of groundwater flow as discussed in Section 3.5.1. Water level elevation data collected from monitoring wells were used to create potentiometric surface maps to illustrate groundwater flow directions and gradients. The data used were obtained in December 2015, following a period of low precipitation, and in January 2018 following a period of high precipitation (Table 3-5).

The shallow bedrock zone potentiometric surface is shown in Figure 3-8, the intermediate zone surface is shown in Figure 3-9, and deep zone surface is shown in Figure 3-10. Groundwater flow is primarily to the northwest with a component of flow to the northeast. The water level elevation data indicate that the bedrock ridge is not acting as a barrier to groundwater flow to the northwest and northeast in the bedrock. Geologic cross section A-A' (Figure 3-5a) is oriented parallel to the primary direction of groundwater flow. Geologic cross section B-B' (Figure 3-5b) is oriented subparallel to the northern component of groundwater flow.

The shallow groundwater zone, defined as approximately 800 to 900 ft amsl, is present only in the source area. Groundwater flow in this zone is primarily to the northwest, with some radial flow to the north and east. This zone is highly fractured and transmissive, allowing for horizontal flow through the shallow, highly fractured bedrock zone and some downward migration (Figure 3-8). The water table and/or perched groundwater in this zone intersects the slope behind the houses on Brookwood Road, discharging as seeps.

Groundwater in the intermediate zone, from 650 to 800 ft amsl, includes the intermediate bedrock aquifer in the source area and the shallow residential area and discharges laterally to the overburden in the Cowboy Creek area (Figure 3-5a). Groundwater flow in this zone is characterized by relatively few transmissive fractures and low vertical gradient. Therefore, groundwater flow migrates slowly through minor fractures, laterally and downward to the northwest, although a northern component remains in the source area. The horizontal gradient within the overburden in the Cowboy Creek area decreases due to the higher transmissivity of the overburden, relative to the bedrock, as groundwater flows to the wetland.

The deep zone, defined from 500 to 650 ft amsl, is characterized by a zone of more abundant fractures throughout the site. Groundwater flows horizontally to the northwest with a low vertical gradient. The high gradient below the slope and the northern component in the source area observed in the intermediate zone are present in the deep zone.

The residential wells adjacent to the site penetrate and interconnect the intermediate and deep zones. Impact of residential well pumping on the bedrock flow patterns was not observed in the synoptic water-level round but may be significant given the density of pumping wells along Brookwood Road and along strike of the major joint set axis. The three water supply wells at the Byram Township schools also may have an impact on groundwater flow in the bedrock.

3.5.3.3 Water Levels and Gradients

Gradients in the bedrock were calculated using the January 2018 synoptic water-level round because it is most complete. Table 3-6a includes the vertical hydraulic gradients between individual MLS ports and between the average elevations for a given aquifer (shallow, intermediate, and deep). Wells MLS-3, MLS-4, MLS-6, and MLS-8 had significant downward gradients (greater than 0.2 ft/foot) between ports, indicating that bedrock fracture flow tends to be isolated to particular fracture sets. Wells MLS-5 and MLS-7 have upward gradients between intermediate and shallow zones with highly transmissive fractures in the shallow zones. This indicates the northern component of intermediate groundwater flow is toward the shallow zone in wells MLS-5 and MLS-7 and the adjacent zone in MLS-2.

At three of the seven bedrock wells in the source area, there is a strong downward vertical gradient between the top three ports (approximately within the top 100 ft of bedrock), with gradients stronger in January 2018, following a rain and snowmelt event, than in December 2015. The higher water levels in the shallow bedrock causing this gradient and the higher water levels in overburden wells in the source area observed in January 2018 are most likely related and consistent with a groundwater mounding due to recharge from precipitation infiltration and runoff.

Table 3-6b includes the horizontal hydraulic gradients between the source area and the wells that appeared to be most directly downgradient, based on available groundwater data. The horizontal gradient in the shallow, intermediate, and deep zones in the bedrock ranged from of 0.13 to 0.16.

3.6 Meteorology

The site is situated within a temperate climate zone characterized by wide variations in seasonal and daily temperatures. The following climate data were obtained between 2007 and 2017 from the Sussex, New Jersey National Weather Service Cooperative Network (COOP) Weather Station Number 288644 located approximately 20 miles northeast of the study area and from the Belvidere Bridge, New Jersey COOP Weather Station Number 280734 located approximately 20 miles southwest of the site (National Oceanic and Atmospheric Administration, 2018a and 2018b). The average annual daily temperature is 51°F, with the average high temperature of 61°F and the average low of 40°F. The average cumulative annual precipitation and snow for the period was 45.21 and 28.87 inches, respectively. Precipitation data from 1 week prior to each sampling event through its conclusion are provided in Table 3-5.

3.7 Demographics and Land Use

The northern portion of the source area (the site) and the residential area to the north are in Byram Township, while the southern portion of the site is in the Borough of Stanhope. Byram Township is a small rural town located just south of Lake Mohawk in northern New Jersey. According to 2010 census data, the approximate year-round population of Byram Township is 8,350, with a total household count of 2,926 and a median age of 41 (U.S. Department of Commerce 2010). The population may fluctuate with the seasons. The site is located adjacent to a populated neighborhood. The area surrounding the site is predominantly developed with housing units, local government facilities, and commercial properties. The site is zoned as a residential district (R-1) in Byram Township, and the residential area to the north is zoned as residential (R-3 and R-4). There does not appear to be any plans for further growth in the immediate area (Byram Township Planning Board 2014).

3.8 Ecological Characterization

CDM Smith documented the plant species and wildlife observed while conducting surface water and sediment sampling at the site on November 11, 2017. The field effort focused on areas that exhibited habitat suitable for supporting populations or ecological communities that may potentially be exposed to SRCs. The primary area of concern consisted of the aquatic and riparian habitat of Cowboy Creek, which flows downgradient of the site. A photolog was prepared to document observations and sampling activities and is provided in Appendix G.

3.8.1 Habitat and Biota

The site sits along the spine of a ridge forming the western edge of the drainage basin for Lake Hopatcong. Ground surface elevations range from approximately 960 ft amsl at the top of the ridge down to approximately 780 ft amsl in the residential neighborhood to the north of the former dump areas. The steepest slopes are located immediately southeast of the residences on

Brookwood Road. Several exposed bedrock outcrops can be observed along the slope. Groundwater seeps were observed flowing out of the exposed bedrock in certain areas. The eastern edge of the site is bounded by a partially abandoned railroad bed, which is located within a steep narrow valley that is approximately 50 ft lower than the walking and biking trail.

Storm water runoff from the former dump areas travels either northwest toward the residential areas or to the north-northeast into an intermittent stream adjacent to the partially abandoned railroad bed. Storm water runoff drains into the intermittent stream during precipitation and periods of high groundwater levels and flows to the north until it empties into Cowboy Creek. Cowboy Creek is a permanent stream located north of the former dump areas and the adjacent residential properties. The upstream reach of Cowboy Creek is a high gradient stream that flows through a well-defined channel. The streams gradient decreases as it travels through the Cowboy Creek area and is composed of various riffle/run/pool sequences. On average, the stream varies between 5 and 12 ft wide with depths ranging from 6 inches to 4 ft deep in some small pools. It should be noted that observations were recorded throughout a season of slightly above average precipitation. The substrate in the upper reaches consists of boulders and sandy gravel. The substrate changes to fine sandy silt as the streams' gradient becomes lower and the stream travels through the wetland.

Photographs referenced in the sections that follow are provided in Appendix G.

Former Dump Areas

The former dump areas consisted of waste disposal trenches (Dump Areas A, B, C, D, and E). Dump Areas A and D offer an edge habitat since they are directly within the cleared utility easement and are surrounded by forested areas. The edge habitat includes a variety of grasses and herbaceous plants throughout the utility easement that offer food and habitat for a variety of fauna. In addition, the easement provides a corridor for animals to travel throughout the area. Dump Areas B, C, and E are located to the west of the walking and biking trail. This area consisted of deciduous forest, including a variety of red maple (*Acer rubrum*), white oak (*Quercus alba*), chestnut oak (*Quercus montana*), red mulberry (*Morus rubra*), and unidentified ash (*Fraxinus* spp.). Understory consisted mainly of herbaceous plants, including ferns. Dump Area B is located at the bottom of a slope that rises approximately 40 ft to the top of the utility easement. Signs of storm water runoff can be seen from the top of the hill down to the bottom of the slope. In addition, standing water was seen at the bottom of the slope. Photos 1 through 10 show the site property and Dump Areas A, C, and D.

Slope Behind Residences Along Brookwood Road

Steep slopes rise from the residences along Brookwood Road and continue nearly 200 ft up to the utility easement and site property. This slope was relatively dry during the time of survey and supported a mature deciduous forest. Tree species observed included chestnut oak, black cherry (*Prunus serotina*), sugar maple (*Acer saccharum*), shagbark hickory (*Carya ovata*), red maple, sassafras (*Sassafras albidum*), sweet birch (*Betula lenta*), American beech (*Fagus grandifolia*), and quaking aspen (*Populus tremuloides*). The sparse understory included greenbrier and ferns. The ridge on top of the slope is primarily occupied by the electric utility easement. Photos 11 through 19 in Appendix G show the steepness of the slope and habitat observed.

Seeps Along Brookwood Road

Seep sampling was conducted within the residential neighborhood, just north of the site property along Brookwood and Ross Roads in July 2017. Seeps were observed discharging from exposed bedrock outcrops and from an actively flowing seep/spring. Both seep and storm water were observed flowing into the catch basins and draining into the Cowboy Creek area. Water runoff from the top of the ridge during high precipitation events drains into the Cowboy Creek area through runoff and the storm sewers as well (Photos 20 through 31).

Cowboy Creek Area

There is a slight drop in elevation between the residences along Brookwood Road and the Cowboy Creek area. There is approximately a 20-foot drop in elevation from Brookwood Road to the Cowboy Creek area. The Cowboy Creek area continues to slope downward until reaching Cowboy Creek and its connected wetlands. This general area was divided into a mature deciduous forest and a freshwater creek/wetland.

The mature deciduous forest contains several intermittent streams that were dry during the time of observation. The terrain slopes down toward Cowboy Creek, with large boulders throughout. The tree canopy is dense, ranging from approximately 85 to 100 percent cover in most areas. The forested area supports a variety of tree species including white oak, swamp white oak (*Quercus bicolor*), red maple, American beech, sweet birch, shagbark hickory, green ash (F*raxinus pennsylvanica*), tulip tree (*Liriodendron tulipifera*), red mulberry, and unidentified oak (*Quercus* spp.). The understory is sparse due to the dense canopy. However, species observed included Japanese barberry (*Berberis thunbergii*), nannyberry (*Viburnum lentago*), beech saplings, and greenbrier (*Smilax* sp.) (Photos 32 through 35).

Cowboy Creek changes from a higher to lower gradient stream as it enters Cowboy Creek area and flows west throughout the wetland as the topography flattens. Several plant species had become seasonally dormant due to the timing of the survey, making identification difficult. Species identified included skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), and cinnamon fern (*Osmunda cinnamomea*). Several grass, sedge, and rush species were observed throughout the wetland. In addition, a healthy patch of wild celery (*Apium* sp.) was observed growing in Cowboy Creek near piezometer sampling location PZ-1 (Photos 37 through 39). Common duckweed (*Lemna* spp.) was observed on top of the surface water. Dominant species along the banks of Cowboy Creek included skunk cabbage and cinnamon fern. Several tree species were identified along Cowboy Creek and within the wetland. Dominant tree species included red mulberry, red maple, swamp white oak, and American beech.

Beaver activities have dramatically altered the landscape within the western extent of the Cowboy Creek area by creating a pond and adding several drainage paths throughout the extended wetland (Photos 40 through 48). Alterations include dams in multiple areas, the largest of which has created a pond that is approximately 350 ft by 200 ft (Photo 49). The pond appeared to be 2 to 3 ft deep. Two beaver lodges were observed within the ponded area. However, no beavers were observed during the survey. It was assumed that these alterations were relatively recent since mature tree stands were still alive within the pond. It should be noted that water was still able to pass through the constructed dams. There is a substantial amount of water that passes through the southern side of the dam and spills into the extended wetland. In addition, water passes over the primary dammed area along the western end of the pond (Photo 50) and continues along Cowboy Creek until it empties into Lubbers Run. Lubbers Run then continues flowing south-southwest until it reaches the Musconetcong River.

Habitats throughout the site appear suitable to support a variety of ecological receptors and communities. Cowboy Creek has the potential to play host to a variety of aquatic organisms, including invertebrates, fish, tadpoles, frogs, and turtles. However, none of these organisms were observed during the survey (Photos 51 through 63).

Wildlife

Wildlife observed during the survey was limited. Most of the wildlife was observed within the Cowboy Creek Area and included the eastern white-tailed deer (*Odocoileus virginianus*), pileated woodpecker (*Hylatomus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*), blue jay (*Cyanocitta cristata),* and eastern gray squirrel (*Sciurus carolinensis*). Deer scat was observed throughout the Cowboy Creek Area. Although bats were not observed during the survey, it should be noted that several shagbark hickory trees offer suitable habitat throughout the site. While not observed, it is likely that a variety of bird, mammal, reptile, and amphibian populations can be supported by the available habitat.

3.8.2 Threatened and Endangered Species and Sensitive Environments

Information regarding T&E species and ecologically sensitive environments that may exist at or near the site was requested from USFWS through EPA and the NJDEP Natural Heritage Program (see Appendix G). Results are presented below.

Federally Listed Species

Information regarding T&E species, species of concern, and ecologically sensitive environments that may exist at or near the site was requested through an Information for Planning and Consultation Report. The USFWS reported that the site is located within areas that provide habitat for the endangered Indiana bat (*Myotis sodalist*), threatened northern long-eared bat (*Myotis septentrionalis*), threatened bog turtle (*Clemmys muhlenbergii*), and threatened small whorled pogonia (*Isotria medeoloides*). Although these species were not observed during the survey, the project area contains suitable habitat for each of the species.

In addition, USFWS reported a list of bird species of concern since they occur on the USFWS Birds of Conservation Concern list or are known to have vulnerabilities within the project area. The following bird species include the bald eagle (*Haliaeetus leucocephalus*), black-billed cuckoo (*coccyzus erythropthalmus*), bobolink (*Dolichonyx oryzivorus*), eastern whip-poor-will (*Antrostomus vociferous*), golden eagle (*Aquila chrysaetos*), golden-winged warbler (*Vermivora chrysoptera*), long-eared owl (*Asio otus*), red-headed woodpecker (*Melanerpes erythrocephalus*), rusty blackbird (*Euphagus carolinus*), wood thrush (*Hylocichla mustelina*), and yellow-bellied sapsucker (*Sphyrapicus varius*).

NJDEP Listed Species

The NJDEP's Natural Heritage Program request letter was sent on December 20, 2017. A response letter was sent on January 3, 2018. The Natural Heritage Program response letter showed a natural heritage priority site that is approximately 0.5 mile northeast of the Cowboy Creek area. This site is classified as a deciduous scrub/shrub and wooded wetlands and deciduous forest adjacent to a stream. In addition, the site contains populations of two unnamed plant species that are imperiled in the state.

In addition, the site and surrounding area were evaluated for rare wildlife species or wildlife habitat. Several species of concern were found both on-site and within the area. The following bird species of concern include the bald eagle, barred owl (*Strix varia*), black-billed cuckoo, Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), veery (*Catharus fuscescens*), wood thrush, and worm-eating warbler (*Helmitheros vermivorum*). The great blue heron (*Ardea herodias*) was found to be near the site property only. One mammal species of concern—the bobcat (*Lynx rufus*), —and one reptile species of concern—wood turtle (*Glyptemys insculpta*)—were found to occur in the site area. In addition, the search found the eastern small-footed myotis (*Myotis leibii*) occurring in the site areas. Vernal habitats were listed on both the site and nearby areas.

Section 4

Nature and Extent of Contamination

This section describes and evaluates the nature and extent of site-related contamination based on the analytical data collected during the RI field investigations and previous investigations. Section 4.1 presents the approach for evaluating contamination at the site including selection of screening criteria, evaluation use of background data collected, selection of site-related contaminants (SRCs), and a summary of the data usability assessment. Sections 4.2 and 4.3 summarize the contaminants found in the various site media.

4.1 Approach to the Evaluation of Contamination

The characterization of site conditions emphasizes the spatial distribution of contaminants in groundwater, soil, surface water, seep water, and sediment. Validated data collected during the 2014/2015 EES JV investigations and the 2017/2018 CDM Smith investigations were primarily used to conduct this evaluation. All detected contaminants were subject to the media-specific screening process and are discussed in Sections 4.2 and 4.3 below.

The RI data was reviewed by comparing results to both site-specific screening criteria (as described in Section 4.1.1) and calculated background threshold values (BTVs) (as described in Section 4.1.2). The organic and inorganic contaminants that were found above both the site-specific screening criteria and the BTVs are discussed in detail in the sections below.

- Other data besides the RI data described above were used in the discussion of the nature and extent of contamination, but were limited to discussion on the makeup of the contamination within the source areas prior to the 2012 removal action

- Historical residential well sampling to understand the changes in groundwater contamination over time

These historical datasets are discussed as necessary, but generally are not included in the data summary tables or on most of the figures.

4.1.1 Site-Specific Screening Criteria

Field investigation sample results were compared against screening criteria to evaluate the nature and extent of contamination in site media. Whenever possible, established regulatory criteria, known as chemical-specific applicable or relevant and appropriate requirements (ARARs), were used for the screening criteria values. In the absence of ARARs, guidance values known as "to be considered" were used. The screening criteria were compiled after review and evaluation of various federal and New Jersey standards and guidance values applicable to soil, groundwater, surface water, and sediment at the site and were submitted to EPA for approval on February 7, 2018. The screening criteria are used to help delineate the extent of site-specific contamination in site media. Separate screening criteria are compiled for use in the human health and ecological risk assessments in accordance with applicable risk assessment guidance documents.

Groundwater screening criteria were selected based first on the lowest of Federal and New Jersey State groundwater quality standards. If no federal or state standards were available, the criteria were selected based on EPA's human health risk screening level for tap water (using a target cancer risk of 1×10^{-6} and a target hazard quotient [HQ] of 1). Surface water screening criteria were similarly selected from the lowest of federal or state standards and guidance values for surface water and freshwater. If none were available, the criteria were based on risk to human health selected from the lowest of NJDEP's Surface Water Quality Standards, Human Health Criteria, and EPA's National Recommended Water Quality Criteria for human health. The groundwater and surface water screening criteria are summarized in Table 4-1.

Soil screening criteria were selected first from NJDEP Residential Direct Contact Soil Remediation Standard. If they were not available for a chemical, then the EPA's human health-based screening level for residential soil (using a target cancer risk of 1×10^{-6} and a target HQ of 1) was used. Finally, if neither of the above standards were available, then ecological screening criteria were selected in a hierarchical manner in the following order (based on availability): NJDEP Ecological Screening Criteria for soil, EPA Ecological Soil Screening Level, Preliminary Remediation Goals for Ecological Endpoints (guidance values), and finally EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels. Sediment criteria was first selected from NJDEP ecological screening criteria (for freshwater), followed by EPA Region 3 Freshwater Sediment Screening Benchmarks, and finally EPA's human health-based screening levels for residential soil (using a target cancer risk of 1×10^{-6} and a target HQ of 1). The soil and sediment screening criteria are summarized in Table 4-2.

Indoor and sub-slab air results are presented from various EPA investigations in Section 4.2.6. and are compared against EPA's vapor intrusion screening levels (VISLs) for sub-slab soil gas and indoor air (generated from the January 2019 EPA VISL calculator for residential scenario, target cancer risk of 1×10^{-6}, and target HQ of 1). The sub-slab screening criterion used for TCE is 15.9 micrograms per cubic meter ($\mu g/m^3$). The indoor air screening criteria used for TCE is 0.48 $\mu g/m^3$ for TCE. Inhalation toxicity data are not available for cis-1,2-DCE. Therefore, no indoor air or sub-slab screening levels have been established.

4.1.2 Background Contaminant Concentrations

Background contaminant levels are important in helping to identify the nature and extent of contamination at the site, particularly when background concentrations are higher than the site-specific screening criteria. Both natural and anthropogenic sources can contribute to elevated levels of contaminants in environmental media that are not related to contamination caused by historical processes. Natural sources of contamination include metals in the native soils of the study area. Anthropogenic sources of contamination, including agricultural and commercial activities, discharges from septic systems, runoff from roadways, and rain-out and dry fallout of airborne pollutants, can also contribute measurable concentrations of contaminants to study area media.

Background or upgradient samples were collected previously by EES JV in 2014 in areas unlikely to have been impacted by site contamination to determine background concentrations for various analytes that are typically found in this type of environment or soil type.

The selection of applicable BTVs for various media is discussed below. These BTVs derived from the background sampling results, along with the screening criteria, were compared with on-site data to help distinguish site-related contamination from concentrations that are elevated due to natural or non-site-related anthropogenic processes. Background sampling results are summarized by media below. When applicable, background sample results are discussed on a media-specific basis in Section 4.3.

- *Soil:* Results from the 10 background soil boring samples (BSB-01 through BSB-10) contained no detections of VOCs, but contained widespread detections of SVOCs with some PAHs exceeding screening criteria in surface soils especially in the west Brookwood area (likely from urban activities). Many metals (including arsenic, chromium, copper, iron, lead, and mercury) exceeded screening criteria in all 10 surface soil samples. Subsurface soils had fewer detections of SVOCs (all below screening criteria) and lower concentrations for most metals (although arsenic, manganese, and aluminum exceeded screening criteria in most samples). Widespread presence of certain metals in surface and subsurface soils suggest naturally occurring elevated levels in local soils.

- *Surface Water:* Results from the nine background surface water samples (BSW01 through BSW07, BSW09, and BSW10) indicated four SVOCs in one location (BSW10) were detected above screening criteria and may be correlated with past influences of the railroad in the area (sample located in a drainage ditch used by an adjacent railroad right-of-way). Select metals (particularly arsenic and manganese) exceeded screening criteria in multiple samples suggesting naturally occurring levels (similar group of metals were found elevated in background soils).

- *Sediment:* Results from 10 background sediment samples (BSED01 through BSED10) showed frequent detections of SVOCs (mainly PAHs) with the most compounds exceeding screening criteria in sediment sample BSED10. Several metals also exceeded their respective screening criteria in multiple samples with the most exceedances also in BSED10. These exceedances may be related to the adjacent railroad right-of-way as they are upgradient of the site.

BTVs for each media are included on Tables 4-3 through 4-10 for each media as appropriate. BTVs were calculated using the EPA ProUCL software, version 5.0 (EPA 2013). Both detect and nondetect analytical results for background samples were imported into ProUCL and evaluated based on data size, data skewness, and data distribution. Results of the statistical testing were used to select the most appropriate 95 percent upper tolerance limit values to be used as the BTVs. Maximum values were used as the background concentration when only one or two detected results were noted (i.e., low-detection frequency analytes). No attempt was made to remove outliers in the background dataset due to the relatively low number of samples. Normality testing revealed that the dataset did not follow any distribution. The statistical analysis of background soil data is included in Appendix A-1 (DESR Report – Appendix L).

4.1.3 Selection of Site-Related Contaminants

The process of identifying SRCs is summarized in Section 4 of this report. As described above all organic and inorganic sampling data are compared to both site-specific screening criteria and calculated BTVs to describe the nature and extent of contamination and is also used to identify which contaminants are considered site-related and described further in Section 5 (Contaminant Fate and Transport) of this report. The following subsections will both expand upon the nature and extent of the identified site-related contaminants as well as provide details as to why other contaminants detected were not included. SRCs include:

- VOCs are discussed in Section 4.2, but CVOCs (primarily TCE and its breakdown products) are considered the primary SRCs and are the focus of Section 4.2 since they have historically been the most widely detected contaminants (previously in the dump area soils) and have recently been detected at elevated concentrations in soils, groundwater, surface water, and vapor.

- Section 4.3 discusses the contaminant distribution of other contaminants and is divided by contaminant group. Each contaminant group is described in relation to its distribution in every media sampled (soils, groundwater, surface water, and sediment) and are discussed but to a lesser degree due to their more limited distribution, concentrations, and/or frequency of detections as compared to CVOCs. The other SRCs include 1,4-dioxane, SVOCs (specifically PAHs), pesticides, PCBs (specifically Aroclor 1254 and Aroclor 1260), and metals (particularly lead and chromium).

4.1.4 RI Data Usability Summary

Data validation was conducted using standard operating procedures outlined in the Mansfield Trail Dump Site, OU2 QAPP (CDM Smith 2017b). EPA performed the data validation for all data except CSIA and QuantArray data, which CDM Smith performed. All analytical data generated and validated during the RI were reviewed to meet the project and user requirements for representativeness, completeness, comparability, precision, and accuracy. The data usability summary report (DUSR) is presented in Appendix H.

For this DUSR, EPA Contract Laboratory Program data packages and subcontract laboratory data packages (Katahdin) for Round 2 and Round 3 groundwater sampling activities were validated and the results reviewed to determine data quality. The data generated by a subcontract laboratory (Microbial Insights) for microbial analysis were not validated but were reviewed by the subject matter experts for use in the RI. Division of Environmental Science and Assessment (DESA) reports were not validated, but were reviewed internally by DESA.

Round 1 groundwater sampling data (from April 2017) were excluded from this RI report and the DUSR due to sampling issues.

Only final qualified data are presented in the RI/FS Report and other reports pertaining to the site. Data that did not meet quality control (QC) criteria were appropriately qualified during data validation. The data are reported with the following qualifiers: estimated “J,” “J+,” “J-,” “JN,” “K,” and “L;” usable but nondetect “U” and “UJ;” and not usable rejected “R.” These terms are defined in Section 4.

Nondetected trace VOC and SVOC results for seven groundwater Round 2 samples and one trip blank were rejected based on cooler temperature and holding time outliers. The affected samples are MLS-08-1-R2, MLS-08-2-R2, MLS-08-3-R2, MLS-08-4-R2, MLS-08-5-R2, MLS-08-6-R2, MLS-

11-6-R2 and TB-21-F17. One nondetect VOC result in groundwater Round 3 sample BY4-DW139 was rejected based on surrogate criteria. These rejected nondetect results are not usable for project decisions. The rejected results do not impact project objectives as either the locations with rejected data are not critical and/or the Round 3 results for the same locations were acceptable and the results were nondetect.

The data generated during the RI/FS are considered definitive data generated under an EPA approved QAPP, using EPA analytical methods and validated according to EPA Region 2 protocols.

The final percentage of valid Round 2 groundwater data is 97.79 percent for groundwater, 100 percent for sediment, soil and surface water, and porewater and 99.99 percent for Round 3 groundwater. The 90 percent completeness goal for usable data has been met.

4.1.5 Data Presentation

The analytical results from the RI were entered into the site database for evaluation purposes. The data were exported to GIS for geological evaluation and visualization software for analysis and graphical representation. All data are presented in units consistent with the data appendices, as follows: soil and sediment data for organic compounds are presented in µg/kg; soil and sediment data for inorganic compounds are presented in mg/kg; and groundwater (both organic and inorganic), porewater, and surface water are presented in µg/L.

Data are compiled for each media into statistical summary tables that are presented as **T**ables 4-3 through 4-10. These tables provide the number and range of detections, exceedances of screening criteria as well as location of maximum detections.

Full data tables for the 2017 data are included in Appendix I and full data tables of the 2014 data are included in Appendix A-1 (DESR – Appendix J).

4.2 Volatile Organic Compound Contamination

VOC contamination is discussed in this section. However, the focus of the discussion is on CVOCs (primarily TCE and cis-1,2-DCE) since they are the primary SRCs. Their detection in residential wells led to the investigation and source removal efforts at the site. Subsequent investigations in 2014 and 2017 detected VOCs in all media sampled.

The discussion of VOC contaminant distribution is focused by media and location starting at the former dump areas (the source) before and after removal efforts (Sections 4.2.1 and 4.2.2); and expanding out into the deeper bedrock matrix beneath the dump areas (Section 4.2.3), and then discusses VOC contamination in groundwater, seeps, and surface water (Section 4.2.4). Contamination in downgradient soils, sediment (Section 4.2.5) and the results of regular VOC vapor monitoring in downgradient residences (Section 4.2.6) are also discussed.

4.2.1 VOCs in Source (Dump) Areas Prior to Excavation

To determine the source of the TCE and cis-1,2-DCE groundwater contamination, investigations were conducted at the former dump areas, beginning in 2009 with an NJDEP soil sampling event at Dump Areas A, B, and D. In 2010, EPA conducted soil and composite waste delineation sampling throughout the dump areas. Results of these investigations revealed contamination was mainly present as TCE and cis-1,2-DCE at Dump Areas A, B, D, and E. Sample concentrations exceeded the 1 percent solubility threshold indicative of dense nonaqueous phase liquid (DNAPL) (14.7 mg/kg for TCE and 35 mg/kg for cis-1,2-DCE). Figures 4-1a and 4-1b present the extent of TCE and cis-1,2-DCE contamination in surface and subsurface soils in the dump areas prior to the removal actions.

In Dump Area A, NJDEP sampled a sludge-like material that contained over 20,000 mg/kg of TCE and elevated concentrations of cis-1,2-DCE. The maximum CVOC concentrations in soil (TCE at 2,900 mg/kg and cis-1,2-DCE at 340 mg/kg) were present at 7 ft bgs with lower concentrations found in shallower depths. Other VOCs including BTEX and 1,2-DCB were also detected. Soil contamination was greater in the upper (southern) trench of Dump Area A than the lower (northern) trench.

At Dump Area B, maximum CVOC concentrations were found at shallow depths between 1 and 2 ft bgs with concentrations of TCE at 200J mg/kg and cis-1,2-DCE at 45 mg/kg. Elevated concentrations of other VOCs (BTEX and chlorinated benzene compounds) were detected (such as toluene at 37 mg/kg and 1,2-DCB at 1,100 mg/kg).

Investigations at the four trenches within Dump Area D revealed VOC contamination present at various depths ranging from the surface down to 12 ft bgs. Trench 2 contained elevated concentrations of TCE and cis-1,2-DCE at depths down to 6 ft bgs. Trench 3 also contained elevated concentrations of the two contaminants down to 1.7 ft bgs. Contamination levels were highest in Trench 2 (260 mg/kg of TCE and 62 mg/kg of cis-1,2-DCE) at 6 ft bgs. This sample also had the highest detections of other VOCs including 1,4-DCB (250 mg/kg) and 1,2-DCB (1,500 mg/kg). Trench 1 samples exhibited low concentrations of CVOCs (less than 0.1 mg/kg per compound) but had elevated concentrations of other VOCs at less than 1 ft bgs (ethylbenzene at 100 mg/kg and total xylenes at 187 mg/kg). No VOCs were detected in samples collected from Trench 4.

At Dump Area E, the maximum VOC concentrations were observed within the upper 2 ft of soils with no contamination observed below 12 ft bgs. The maximum concentrations of TCE and cis-1,2-DCE (220 mg/kg and 120 mg/kg, respectively) were observed in surface soils, and concentrations decreased with depth. Concentrations of other VOCs (e.g., 1,2,4-trichlorobenzene up to 1,800 mg/kg, 1,2-DCB up to 4,900 mg/kg, and toluene up to 310 mg/kg) also decreased with depth.

The EPA ERRS contractor excavated 40 test pit locations in Dump Areas A, B, C, D, and E and collected 42 composite samples for waste characterization (full toxicity characteristic leaching procedure analysis) in February 2012. Based on waste characterization sampling results, ERRS designated soils in the dump areas as either hazardous or non-hazardous waste materials (Figure 4-2). During the March 2012 excavation at Dump Areas A, B, and D, hazardous and non-hazardous excavated soils were stockpiled into separate piles in Dump Area E (Figure 4-3). Post excavation confirmation sampling conducted in late March 2012 in Dump Areas A, B, and D revealed additional samples in the upper trench of Dump A near or above the 1,000 µg/kg action level for TCE. As a result, this area was re-excavated in April 2012 (Figure 4-4). From March to May 2012, approximately 11,170 tons of non-hazardous waste, 224 tons of hazardous waste meeting Universal Treatment Standards (UTSs), and 159 tons of hazardous waste exceeding UTSs (according to the RCRA regulations) were removed in total and transported to approved off-site disposal facilities meeting the RCRA guidelines.

Pre-excavation sampling also was conducted by ERRS at Dump Area C just prior to the removal action in March 2012. Sample analyses did not reveal any contaminant concentrations above NJDEP soil cleanup standards. As a result, no removal action was taken at this dump area.

4.2.2 VOCs in Source (Dump) Areas Post Excavation

In August and September 2013, EES JV conducted shallow overburden field screening in the source areas to investigate whether contamination from the dump areas or other potential contaminant sources remained on-site after excavation. It is important to highlight that all sampling was in the overburden and not in the underlying bedrock. Samples within each dump area were also most likely from backfilled soil, not native soil, considering the dump areas were graded and backfilled with excess soil from grading Dump Areas A and B after the removal action in 2012.

Field screening was conducted, including XRF of surface soil samples (0 to 6 inches) for TAL metals and PID and mobile laboratory gas chromatograph/mass spectrometer measurements of VOCs in subsurface soil gas (1.5 to 6 ft bgs). The screening was conducted in a grid pattern throughout the source areas (Appendix A-1 – DESR Figure 3-1). Thirty VOCs were detected in soil gas, with TCE detected most frequently in and around Dump Area D (15 to 75 parts per billion by volume [ppbv]), in and around Dump Area E (15 and 175 ppbv), and at one location in Dump Area A (below 10 ppbv).

Based on the results of the screening, 40 DPT borings were advanced in the source areas to further investigate soils in November and December 2013. One surface soil sample and one subsurface soil sample were collected at each location and analyzed for VOCs, SVOCs, PCBs, pesticides, and metals. Based on the soil analytical data, EES JV selected 20 locations to advance MIP using DPT to obtain depth profiles of overburden properties such as electrical conductivity and water pressure with in real time. This was completed in January 2014. In February 2014, EES JV advanced 10 additional borings at locations where MIP data indicated potential VOC impacts. One subsurface soil sample from each boring was collected for VOC analysis.

Results from post excavation confirmation soil samples and source area DPT soil sample analytical results from EES JV are summarized below. Only contaminant concentrations exceeding screening criteria are discussed below. Figures 4-5a and 4-5b present the extent of TCE and cis-1,2-DCE contamination in surface and subsurface soils in the dump areas that remained following the removal actions. A summary of the data is included in Table 4-3.

Review of the results found that majority of the VOC contamination was removed from the former dump areas. This was supported by the soil gas and MIP results, which suggested minor impacts within the overburden soils in and around the former dump areas. The following discussion summarizes the investigation results.

Former Dump Area A: No VOCs were detected in surface or subsurface soil samples at Dump Area A down to the explored depth of 6 ft bgs.

Former Dump Area B: Only one CVOC (methylene chloride) was detected at 14 µg/kg in SB-16. One detection of another VOC (1,2-DCB) was found at 6,900 µg/kg in S-154. However, no VOCs were detected in subsurface samples down to the explored depth of 3 ft bgs.

Former Dump Area D: The CVOC, methylene chloride was detected at the center of Dump Area D at 1,400J µg/kg from 3.5 to 5.5 ft bgs (SB-05). Other VOCs detected in the same location included 1,4-DCB at 5,600 µg/kg and chlorobenzene at 14,000 µg/kg. VOCs in surface soils were either nondetect or detected at trace concentrations, including methylene chloride at 5 µg/kg.

Former Dump Area E: Low concentrations of CVOCs were observed exceeding screening criteria in the subsurface around the southern perimeter of Dump Area E at depths ranging from 3.5 to 7 ft bgs (SB-38, SB-51, and SB-54). These included TCE (maximum 25J µg/kg), cis-1,2-DCE (maximum 450 µg/kg), and vinyl chloride (maximum 46 µg/kg). In the same areas, other VOCs were also detected including 1,4-DCB at a maximum concentration of 3,300 µg/kg and chlorobenzene at a maximum concentration of 4,800 µg/kg.

Former Dump Area C: Since no removal action was conducted at Dump Area C, conditions are assumed to be the same as indicated by the pre-excavation investigation.

4.2.3 VOC Contamination in the Bedrock Matrix or as NAPL

In addition to sampling and excavation within the former dump trenches and surrounding overburden soils, some of the initial RI field investigations in 2014 and 2015 targeted other potential continuing sources of VOC contamination below the former dump areas. This included a bedrock matrix diffusion study (included in Appendix A-1 – DESR Appendix F) and observations and sampling during drilling to determine if NAPL was encountered.

Rock Core Sampling and Analysis Study

In April and August 2014, bedrock cores were advanced continuously in three locations (Appendix A-1 – DESR Figure 2-1) terminating at a depth of 222 ft bgs at CB-1, 68 ft bgs at CB-2, and 102 ft bgs at CB-3.

Sample locations were selected for VOC analysis based on fracture distributions and lithology. A total of 50 rock samples were collected for VOC analysis (25 from CB-1, 12 from CB-2, and 13 from CB-3). An additional 12 rock samples were collected for physical properties analysis including TOC, bulk density, specific gravity, water content, and porosity (6 from CB-1, 3 from CB-2, and 3 from CB-3). Whole rock VOC concentrations were converted to porewater concentrations based on the physical properties of the rock cores (porosity, moisture content, etc.). TCE was detected in one bedrock sample from the northern perimeter of Dump Area D (CB-1) at 24.5 ft bgs (17 µg/kg). The calculated porewater concentration at this location was 180J µg/L. TCE was not detected in the bedrock samples from the center of Dump Area E (CB-2) and the upper trench of Dump Area A (CB-3).

Cis-1,2-DCE was not detected in CB-1 but was detected in almost every sample from CB-2 (at concentrations up to 12J µg/kg with estimated porewater concentrations up to 310J µg/L) and CB-3 (up to 13.5J µg/kg with estimated porewater concentrations up to 420 µg/L). However, because blank contamination was encountered during the analysis of CB-2 and CB-3 samples, all detections of cis-1,2-DCE were reported as estimates and may have reflected higher cis-1,2-DCE concentrations than present in the rock samples. Other frequently detected CVOCs that were impacted by blank contamination in CB-2 and CB-3 included chloroform, 1,1-DCE, trans-1,2-DCE, carbon tetrachloride, and 1,1- dichloroethane (DCA). Regardless, the highest concentrations of CVOCs in estimated porewater were detected below the upper trench of Dump Area A between 45 and 80 ft bgs (CB-3) close to the rubble zone where NAPL was discovered (discussed below).

Other VOCs were detected in rock core samples (benzene in CB-2 and CB-3 and toluene in CB-2), but the magnitude of these results may be biased high since they were affected by blank contamination.

The rock core sampling results indicate that the contaminant concentrations in the rock matrix appear to be low and that the bedrock matrix does not appear to hold a significant mass of contamination to provide a source to drive the ongoing groundwater contamination. Rock coring was limited to three locations; the rock coring locations were selected in the most contaminated fractured bedrock areas of the site and thus represent a worst-case scenario of matrix diffusion conditions across the site.

Observations of NAPL

During the rock core sampling and analysis, the full length of each core was visually observed for the presence of NAPL and screened with a PID. NAPL was identified within a rubble zone at approximately 68 ft bgs in the upper trench of Dump Area A (CB-3). However, there was not enough volume to collect a sample of this material. VOC rock sampling analytical results and estimated porewater concentrations near the rubble zone (between 45 and 80 ft bgs) consisted mainly of the CVOCs, cis-1,2-DCE, 1,1-DCE, trans-1,2-DCE, 1,1-DCA, and chloroform and a VOC, benzene. The NAPL likely consists of the same or similar chemicals and may act as a small source area for the surrounding VOC contamination.

NAPL also was discovered on a FLUTe liner and on geophysical instrumentation used in bedrock borehole MLS-2. The NAPL appeared to be at a depth of 100 to 150 ft bgs and was similar in appearance to degraded used motor oil. Sampling of the NAPL on the liner in MLS-2 indicated the NAPL consisted of approximately 2 percent phthalates, 8 percent diesel range organics, and 4 percent oil range organics. CVOCs detected included TCE (at 700 μg/kg), PCE (at 190 μg/kg), and 1,1- trichloroethane (TCA) (at 690 μg/kg). Based on the sample results and field observations, the NAPL appears to be mainly a light nonaqueous phase liquid (LNAPL) consisting primarily of fuels and oil products, not a significant DNAPL source for the site. Analytical results from a water sample containing free product taken from MLS-2 also indicated a concentration of TCE at 67 μg/L and no detection of cis-1,2-DCE. Recent sampling of groundwater wells (Round 2 and Round 3) shows that the TCE and cis-1,2-DCE concentrations are relatively low (below 200 μg/L and 30 μg/L, respectively) when compared to the 1 percent of solubility guideline (Cohen and Mercer 1993) indicative of potential DNAPLs. Furthermore, chlorinated DNAPLs mixed with petroleum LNAPLs tend to preferentially partition into the petroleum rather than into the groundwater. These observations further support the conclusion that the mixed NAPL encountered at MLS-2 is not likely contributing significantly to the overall groundwater plume although some contribution to local low-level TCE and cis-1,2-DCE contamination may still be occurring. Since no significant pure DNAPL source was encountered during investigations, any DNAPL present in bedrock may only exist as immobile DNAPL in limited quantities (e.g., a limited percentage of the pore volume is saturated with DNAPL) or mixed with LNAPLs (as observed in MLS-2) in localized areas of the bedrock.

4.2.4 VOCs in Groundwater, Seeps, and Surface Water

VOCs, primarily CVOCs, were detected in groundwater initially in 2005 by NJDEP. Investigations to determine the source of the VOC contamination involved sampling numerous residential wells and monitoring wells during various times.

As discussed previously, the source area contamination has historically consisted of CVOCs (primarily TCE and cis-1,2-DCE). CVOCs have also been the most detected contaminants in groundwater, based on previous investigations (Section 1.2.4). Thus, this subsection focuses on the extent of CVOCs found in the site groundwater during the most recent groundwater sampling events (November 2017 and January 2018) and compares that data to groundwater sampling performed during the 2014 EES JV investigation. Residential well (pre-treatment) data collected by NJDEP since 2004 also is used to evaluate the potential change in groundwater CVOC contamination based on the source removal conducted in the former dump areas.

4.2.4.1 Current Extent of CVOC Contamination

Groundwater, seep, and surface water samples were collected during the November 2017 event and groundwater samples were collected from a targeted subset of monitoring wells during the January 2018 event. The November 2017 sampling event was a comprehensive round and is used to describe the full extent of CVOC contamination. The January 2018 sampling results are used to confirm the results of the November 2017 event.

Several CVOCs were detected above screening criteria during the November 2017 and January 2018 sampling events including TCE, cis-1,2-DCE, vinyl chloride, PCE, 1,1,1- TCA and 1,1- DCA. A statistical summary of the sampling results is included on Tables 4-5, 4-6, and 4-7.

Extent of TCE Contamination

TCE was detected in 58 of the 89 groundwater samples collected in November 2017, with concentrations ranging from 0.24J to 180 μg/L. Concentrations in the January 2018 sampling event were similar, with TCE exceeding screening criteria in 46 of 78 wells sampled, with a maximum concentration of 190 μg/L.

Figures 4-6 and 4-7 show the extent of TCE and cis-1,2-DCE in the overburden and bedrock groundwater systems, respectively. The TCE and cis-1,2-DCE isoconcentration contours are presented to show the potential extent of the plumes, but it is important to understand that due to the nature of the fractured bedrock system, fracture zones, and groundwater movement, the extent of contamination will be anisotropic. As such, the contoured extents may slightly over-represent the extent of contamination.

TCE in Former Dump Area Groundwater

In the former dump areas, groundwater is present in the overburden, but only in the areas where the bedrock surface dips and the overburden layer is thicker, primarily near Dump Areas B, C, and E. The maximum concentration of TCE in shallow wells MW-4, MW-5, and MW-6 installed in this area was only 0.24J μg/L at MW-6. The water table here was shallow (around 5 to 10 ft bgs).

The highest concentrations of TCE and other CVOCs were in the bedrock monitoring wells installed beneath the former dump areas. Figures 4-8 and 4-9 present two cross-sectional views of the TCE and cis-1,2-DCE concentrations in the monitoring wells.

TCE concentrations in MLS-3 and MLS-4 installed in bedrock beneath Dump Area A were elevated in the upper portion of the saturated bedrock (nearly 65 to 80 ft bgs) with concentrations as high as 180 µg/L in the third port of MLS-3 (MLS-3-3) and 160 µg/L in the shallowest port of MLS-4 (MLS-4-1). Concentrations in these well clusters remained elevated in the deepest ports (130 µ g/L in MLS-4-P6 at 460 to 475 ft bgs). The elevated concentrations of TCE found in nearly every fracture zone in these wells supports the model presented in Section 3 that a limited number of transmissive fractures carry the majority of groundwater through the bedrock system, but the complex system of less transmissive fractures creates a fracture network capable of supporting contaminant migration away from the source areas both laterally and vertically.

Groundwater in the bedrock below Dump Area D also had elevated TCE and other CVOC concentrations. Samples from the upper ports of monitoring wells MLS-2 and MLS-7 on the northern end of the former dump areas contained elevated TCE concentrations (at concentrations up to 88 µg/L in MLS-2 and up to 51 µg/L in MLS-7). The water table was closer to the bedrock surface in this area (approximately 35 to 40 ft bgs), and as shown on Figure 4-9, the extent of elevated TCE concentrations in this area were limited to about 135 ft bgs.

<u>TCE Migration in Groundwater</u>

As described in Section 3, the migration of groundwater from the elevated former dump areas to the north-northwest is limited to flow from the elevated areas through the fractured bedrock system, discharging to surficial seeps and the overburden groundwater in the lower areas, or flowing deeper into the bedrock system. Sampling data presented on various cross sections and plan view figures confirm that TCE contamination has followed these pathways migrating away from the source zones in the former dump areas through the bedrock groundwater fracture system into the overburden and bedrock groundwater system below the residential and Cowboy Creek areas.

The shallowest representation of contaminated groundwater migration would be groundwater seeping from the bedrock cliff face. Figure 4-6 shows the results from eight samples that were collected from seeps and other shallow groundwater discharges from or near the bedrock cliff face. Two of the seven samples contained TCE with the highest concentration in SP-02 at 34 µg/L. These results are summarized on Table 4-8.

The bedrock flow system feeds into the overburden groundwater in the residential and Cowboy Creek areas. TCE was detected in four of the eight shallow overburden monitoring wells screened in the downgradient overburden aquifer, exceeding the RI screening criteria of 1 µg/L in each well with the highest concentration detected at MW-13 at 11 µg/L. TCE was detected in only one of the four piezometers, PZ-1 (3.1 µg/L), screened below Cowboy Creek. Figure 4-6 shows that the extent of TCE in the overburden groundwater likely extends into the Cowboy Creek wetland area and discharges to the creek at low concentrations. Surface water sampling in 2014 and 2017 supported this conclusion with TCE detected at a low concentration one downstream surface water location (SW-03 at 0.15 µg/L). Surface water results are summarized on Table 4-9.

Cross sections A-A' and B-B' (Figures 4-8 and 4-9) show the extent of TCE contamination that has migrated downgradient from the source areas into the deep bedrock groundwater and the residential area wells. The depth of the TCE contamination seen in MLS-3 and MLS-4 is confirmed as it is found at similar or even deeper elevations in MLS-9 and MLS-11 to the northwest. The contamination seen in the shallower bedrock zones at MLS-2 and MLS-7 also appears to be migrating to the northwest toward MLS-13. Movement of contamination in this direction is expected, as the primary dip of the bedrock fractures is in a generally northwest direction.

The number of multi-level bedrock wells in the residential and Cowboy Creek area was limited by access constraints, but Figure 4-10 shows a representative view of the extent of contamination within the bedrock groundwater system using the November 2017 residential well sampling results. The presence of contaminated wells downgradient from the former dump areas reinforce the conclusion that groundwater transports contamination in numerous directions through a complex system of fractures propagating away from the elevated bedrock ridge where the former dump areas were located.

The extent of the bedrock groundwater contamination quickly decreases moving away from the elevated source areas, past the residential area and into the Cowboy Creek area and is eventually delineated to the northwest by MLS-14, installed at the school. Although the deepest sampling interval at MLS-14 is shallower than the contaminated deep intervals in MLS-11, borehole geophysical analysis concluded there was little transmissivity in the bottom 100 ft of the borehole. Therefore, contaminated groundwater is not expected to extend to MLS-14 in this interval.

<u>Extent of cis-1,2-DCE and Other CVOC Contamination</u>

Other CVOCs were detected in the site groundwater including cis-1,2-DCE, vinyl chloride, 1,1-DCA, 1,1,1-TCA, PCE, and chloroethane.

- Cis-1,2-DCE was detected in 62 of the 89 groundwater samples collected in November 2017 with concentrations ranging from 0.14J to 230 µg/L. Only two of those samples exceeded the RI screening criteria of 70 µg/L. Concentrations in the January 2018 sampling event were similar, with cis-1,2-DCE exceeding screening criteria in 2 of 78 samples (detected in 60 of 78 samples), with a maximum concentration of 240 µg/L.

- 1,1-DCA (detected in 46 of 89 groundwater sample, with a maximum concentration of 160 µg/L), 1,1,1-TCA (detected in 33 of 89 groundwater samples, with a maximum concentration of 120 µg/L), and chloroethane (detected in 2 of 89 samples, with a maximum concentration of 87 µg/L) all exceeded their respective RI screening criteria only in samples collected from the upper three ports of MLS-2. Concentrations detected in the January 2018 sampling event were similar for all three compounds.

- Vinyl chloride was detected as high as 39 µg/L in 14 of the 89 groundwater samples collected in November 2017. Eight of those samples exceeded the RI screening criteria of 1 µg/L. Concentrations in the January 2018 sampling event were similar, with 6 of 78 samples exceeding criteria (detected in 34 of 78 samples), with a maximum concentration of 44 µg/L.

Figures 4-6 and 4-7 present the extent of cis-1,2-DCE in the overburden and bedrock groundwater system. The other CVOCs discussed above are generally found at lower concentrations, but relative concentrations and locations are similar to the pattern of cis-1,2-DCE concentrations in the groundwater. Therefore, the discussion below will focus on the distribution of cis-1,2-DCE in relation to TCE and provide additional detail about the other CVOCs as appropriate.

cis-1,2-DCE and other CVOCs in Former Dump Area Groundwater

Similar to TCE, there were minimal detections of cis-1,2-DCE in the overburden groundwater in the former dump areas. Cis-1,2-DCE at a concentration of 0.21J μg/L in MW-4 was the only detection of a CVOC other than TCE.

Elevated concentrations of these compounds were found in the bedrock aquifer below the former dump areas. Figures 4-8 and 4-9 present two cross-sectional views of the cis-1,2-DCE concentrations in the wells. Cis-1,2-DCE concentrations in the bedrock below Dump Area A at MLS-3 and MLS-4 ranged from 2.9 to 23 μg/L, which are much lower than the TCE concentrations observed in the same ports. This differs from the pattern of CVOC concentrations in MLS-2 near Dump Area D and MLS-6 east of Dump Area E, where cis-1,2-DCE concentrations exceed TCE concentrations detected in the same ports.

The sample collected from the shallowest port of MLS-2, screened at 35 to 50 ft bgs in the bedrock below the northern end of Dump Area D, contained the maximum concentrations of cis-1,2-DCE (230 μg/L), vinyl chloride (39 μg/L), 1,1-DCA (160 μg/L), 1,1,1-TCA (120 μg/L), and chloroethane (87 μg/L) observed at the site. These concentrations are above or within the same order of magnitude as the TCE concentration (88 μg/L) in this port. However, the other wells screened near Dump Area D did not contain elevated concentrations of cis-1,2-DCE or the other CVOCs as compared to TCE.

MLS-6 is the only other monitoring well located in a former dump area that had a ratio of CVOC concentrations similar to MLS-2. MLS-6 is installed in the bedrock aquifer east of Dump Area E and contained cis-1,2-DCE, vinyl chloride, 1,1-DCA, and 1,1,1-TCA at concentrations greater than the TCE concentrations in the same ports.

These contaminant concentrations at MLS-2 and MLS-6 found primarily in the shallower portion of the bedrock aquifer suggest that the source of groundwater CVOC contamination in this area is localized, possibly made up of a different blend of CVOCs or more degraded as compared to the source of the TCE below Dump Area A, which shows little evidence of degradation. The presence of mixed NAPL in MLS-2 also suggests that biodegradation of the petroleum LNAPL component of the mixed NAPL may have increased the carbon available to facilitate biodegradation of the TCE. This would also help explain why TCE concentrations in this area are lower than cis-1,2-DCE.

cis-1,2-DCE and other CVOCs Migration in Groundwater

As described above, the migration of groundwater from the elevated former dump areas to the north-northwest is complex. TCE concentrations found in seeps, residential wells, and overburden and bedrock monitoring wells confirm contaminant transport is occurring through the fractured bedrock flow system.

Similar to TCE, cis-1,2-DCE and other CVOCs (1,1,1-TCA, 1,1-DCA) were detected in the seep samples collected in 2017. The highest concentration of cis-1,2-DCE was 17 µg/L, half the TCE concentration (34 µg/L) detected in the sample.

The bedrock flow system also feeds into the overburden groundwater in the residential and Cowboy Creek areas. Similar to TCE, cis-1,2-DCE was detected in four of the eight shallow overburden monitoring wells screened in the downgradient overburden aquifer, with a maximum concentration of 3.4 µg/L. Cis-1,2-DCE also was detected in only one of the six piezometers and in the same piezometer that contained TCE. This piezometer is screened below Cowboy Creek and contained cis-1,2-DCE at a concentration of 2.4 µg/L. Figure 4-6 presents the extent of cis-1,2-DCE in the overburden groundwater. The extent of cis-1,2-DCE mirrors that of TCE; however, cis-1,2-DCE is present at lower concentrations than TCE in each well. Surface water sampling in 2014 and 2017 detected cis-1,2-DCE in only one location at a low concentration (0.3 µg/L at SW-03).

Cross section A-A’ and B-B’ are presented on Figures 4-8 and 4-9 and show that cis-1,2-DCE, like TCE, has migrated from the source areas into the deep bedrock groundwater and into the residential area wells. The extent of cis-1,2-DCE contamination in the downgradient bedrock wells mirrors that of TCE; however, the cis-1,2-DCE concentrations are generally at least 50 percent lower than their co-located TCE concentrations.

In residential wells, cis-1,2-DCE was detected most frequently at concentrations ranging from 0.28J to 67 µg/L. Other CVOCs (such as 1,1-DCA and trans-1,2-DCE) were also detected at trace concentrations. None of these detected CVOCs exceeded the RI screening criteria.

4.2.4.2 CVOC Contamination in 2014

The November 2017 and January 2018 groundwater sampling events (Rounds 2 and 3) described in the Section 4.2.4.1 provide the current extent of CVOC contamination within the site groundwater. Both sampling rounds were performed when the static water levels in the aquifer were more elevated than average due to recent precipitation or snow melt events. These rounds of data provide a snapshot of the groundwater environment. Sampling has been completed at the site in the past, but majority of the wells were not installed until 2013 and 2014, after contaminated soil at the former dump areas was excavated. The round of groundwater samples collected in November 2014 provides another snapshot of the extent of groundwater contamination after the removal actions took place, but at a time of lower static groundwater levels.

Several CVOCs were detected above screening criteria during the November 2014 sampling event including TCE, cis-1,2-DCE, PCE, vinyl chloride, 1,1-TCA, 1,1-DCA, and 1,1-DCE. A statistical summary of the sampling results and the full data tables are included in Appendix A-1 (DESR – Tables 5-2 through 5-36b).

Similar to the 2017 and 2018 sampling results, TCE was found above the RI screening criteria throughout much of the site in the 2014 sampling event. Overall TCE exceeded criteria in 68 of 107 groundwater samples collected from monitoring wells. Figures 4-11 and 4-12 show the extent of TCE and cis-1,2-DCE in overburden and bedrock monitoring wells as sampled in 2014. Other CVOCs were detected, but their concentrations did not frequently exceed criteria.

CVOCs in Former Dump Area Groundwater

Similar to the 2017 sampling results, the maximum TCE concentrations and all CVOC detections in November 2014 were located in bedrock groundwater below the former dump areas. Cross-section A-A' presented on Figure 4-13 shows the elevated TCE concentrations detected in the 2014 sampling in MLS-3 and MLS-4 installed in bedrock below Dump Area A.

Similar to 2017, the highest TCE concentrations were in the upper portion of the saturated bedrock (approximately 65 to 80 ft bgs) with maximum concentrations of 320 µg/L in MLS-3-P1 and 120 µg/L in MLS-4-P1. These concentrations were greater than those observed in 2017, with a maximum concentration of 180 µg/L. Elevated concentrations were not present in the deepest ports of MLS-3 as they were in 2017. Cross section A-A' shows that the overall depth of TCE contamination below the source areas and downgradient appears to be much shallower. Cis-1,2-DCE concentrations in these wells were higher in 2014 as compared to 2017. Figure 4-13 shows cis-1,2-DCE concentrations elevated in shallow and deeper ports similar to the elevated TCE concentrations.

Groundwater in the bedrock below Dump Area D also contained elevated concentrations of TCE and other CVOCs. MLS-2 and MLS-7 on the northern end of the former dump areas contained elevated TCE concentrations in samples collected from the upper ports and, similar to the wells screened below Dump Area A, the TCE concentrations were greater in 2014 as compared to the concentrations in 2017, with a maximum TCE concentrations of 130 µg/L in port 2 of MLS-7. Much like 2017, the depth of contamination in this area is much shallower compared to the bedrock below Dump Area A, limited to about 135 ft bgs as shown on Cross-section B-B' on Figure 4-14.

In 2017, the upper port of MLS-2 contained elevated concentrations of cis-1,2-DCE (230 µg/L), vinyl chloride (39 µg/L), 1,1-DCA (160 µg/L), 1,1,1-TCA (120 µg/L), and chloroethane (87 µg/L). During the 2014 sampling, the uppermost port was dry, but the cis-1,2-DCE concentration in port 2 of MLS-2 was 120 µg/L. However, the cis-1,2-DCE concentration in this port in 2017 was 11 µg/L. Concentrations of the other compounds in 2017 were much lower than those observed in 2014.

CVOCs in Downgradient Groundwater in 2014

The results of the 2014 sampling showed CVOC concentrations in the downgradient areas similar to what was seen in 2017. TCE concentrations in the overburden wells were similar, with a maximum concentration of 17 µg/L at MW-13 (11 µg/L in 2017). The extent of contamination was also similar and is shown on Figure 4-11. Cis-1,2-DCE concentrations and extent in these overburden wells in 2014 were similar to those concentrations observed in 2017.

In 2014, TCE concentrations observed in the bedrock wells in the downgradient areas are similar to those concentrations observed in the 2017 sampling, with the maximum concentration of 34 µg/L at MLS-9. The TCE concentration in this well in 2017 was 36 µg/L. However, as observed in the bedrock below the source areas, TCE was observed in deeper fractures in both MLS-9 and MLS-11 in 2017, appearing to be either related to deeper contamination in the wells below the source areas or related to groundwater plume migration away and downward from the source areas. Cis,1-2-DCE detections in these wells were similar with slightly more elevated concentrations in deeper ports.

Key Findings

The differences in the patterns of contamination observed in November 2014 compared to November 2017 appear to likely represent two snapshots of the impact infiltration has on the contamination migrating from a source zone.

The data from 2014 showed a system with low water levels after a period with limited precipitation (0.57 inches in the previous 2 weeks). TCE concentrations at the water table below the dump areas were more elevated, and contamination generally decreased with depth and was not detected at a distance as far from the source areas or as deep within the deep bedrock flow system as observed in 2017. CVOC contamination in the deeper system contained relatively higher concentrations of cis-1,2-DCE, potentially because TCE from the source areas had not been transported by infiltration and recharge to the deeper groundwater due to the limited precipitation or snow melt at the time.

On the other hand, in 2017, TCE concentrations were somewhat lower at the water table and higher in the deeper bedrock as compared to the concentrations observed in 2014. Additionally, TCE was detected at a greater lateral and vertical distance from the source areas in the bedrock flow system in 2017 than in 2014. For example in MLS-7, TCE and cis-1,2-DCE concentrations decreased from 2014 to 2017 in all ports, suggesting that contamination has been diluting and dispersing farther away and downward from the source areas aided by active natural attenuation processes. Cis-1,2-DCE concentrations are relatively lower compared to TCE concentrations, potentially because infiltration from precipitation (2.84 inches in the previous 2 weeks) has transported TCE into the bedrock groundwater system. However, this is not observed at MLS-2, where increased precipitation may have interfered with attenuation by increasing the dissolution of a different or more degraded source (such as the mixed NAPL discussed in Section 4.2.3), resulting in greater concentrations of TCE, cis-1,2-DCE, and other CVOCs in 2017 than in 2014.

4.2.4.3 Temporal Changes in CVOC Concentrations in Residential Wells

The datasets described above are limited since most of the monitoring wells at the site, except for the residential wells, were installed after the source removal activities at the former dump areas. The residential wells immediately downgradient of the former dump areas were installed prior to the removal activities and provide a set of relative data points from 2005 to present. However, it is important to note that these wells are open bedrock borehole wells (with total depths ranging from 100 to 300 ft bgs) and therefore do not provide groundwater data from discrete intervals.

Figure 4-15 presents the TCE concentration in a subset of residential wells that contain significantly elevated contaminant concentrations. Generally, the concentrations appear to be consistent over time. There appears to have been a slight decreasing trend from 2005 to 2012. Concentrations from the 2013 sampling, which was one year after the source removal activities, generally increased and then began a downward trend in the years that followed.

This increase in concentrations could be an anomaly caused by the disturbance of a vadose zone source during excavation or drilling that may have mobilized contamination into the system. However, as noted previously, the concentrations are complicated by the amount of infiltration entering the system and the amount of variance in monitoring well concentrations caused by infiltration (as observed between the November 2014 and November 2017 sampling results), obscuring the apparent trends. In addition, most of the historical residential well sampling data were collected by NJDEP, whereas more of the recent residential well sampling data have been collected by EPA. Therefore, laboratory methods, reporting limits, and sample collection procedures may not have been consistent over time.

4.2.5 VOCs in Downgradient Soils and Sediments

Sampling in the residential area soils and within the sediments did not reveal any VOCs above the RI screening criteria. The only CVOC detected was TCE in 3 of 16 soil samples at a maximum concentration of 5.3 µg/kg. No CVOCs were detected in sediment samples. Table 4-4 (Residential Area Soils) and Table 4-10 (Sediments) present a summary of the 2017 results. A summary of the 2014 sampling results is included in Appendix A-1.

4.2.6 VOCs in Indoor Air

4.2.6.1 Past Results

EES JV conducted sub-slab and indoor air vapor sampling at 16 residences associated with the residential wells in two rounds. The first round of sampling was conducted in January 2014. At one residence (BYR-DW115 location), the second round was conducted early (April 2014) because EES JV had discovered that the SSDS at the property had not been functioning in the first round (January 2014). Second round sampling was conducted at the remaining 15 residencies in November 2014. EPA repeated vapor sampling at two properties in March 2016 (BYR-DW113 and BYR-DW126 locations).

The two rounds of 2014 results and the 2016 results were compared to historical data from March 2012 and October 2011 (See Section 1.2.4.3) for evaluation. TCE was the most frequently detected contamination with concentrations exceeding both the sub-slab screening criterion (15.9 µg/m^3) and indoor air screening criterion (0.48 µg/m^3) in multiple rounds of sampling.

The maximum sub-slab vapor TCE concentrations were observed at the property where residential well BYR-DW113 is located (Figure 2-6), which increased from 103 µg/m^3 in March 2012 to 1,400 µg/m^3 in January 2014. Since the peak concentration in 2014, sub-slab concentrations of TCE decreased to 180 µg/m^3 in April 2016. Indoor air concentrations of TCE show a similar trend, peaking in January 2014 with a concentration of 8.6 µg/m^3 and decreasing thereafter to a concentration of 0.91 µg/m^3 in April 2016. This property has an SSDS installed.

At the location of BYR-DW129, elevated TCE concentrations were observed in the residential property sub-slab vapor in November 2011, with a maximum concentration of 72.2 µg/m^3. However, TCE sub-slab vapor concentrations decreased to 22.3 µg/m^3 in March 2012 and have since been below the TCE sub-slab screening criterion (15.9 µg/m^3). Indoor air was not sampled at this property in November 2011, but VOCs have not been detected in indoor air during subsequent sampling events (March 2012 and January and November 2014). This property has a radon system installed. VOCs have not been detected in indoor air samples collected at the property.

In January 2014, sub-slab vapor TCE concentrations at the residential property associated with BYR-DW125 peaked at 67 µg/m^3. This corresponded to a high indoor air concentration of TCE at 4.7 µg/m^3. Concentrations decreased to below the screening level in November of the same year while the indoor air concentration of TCE remained high at 2.4 μg/m³. This property has an existing radon system, which has been modified by NJDEP to better address VOC vapor intrusion.

At the residential property associated with BYR-DW130, concentrations of TCE in sub-slab vapor have fluctuated and peaked at 19 μg/m³ in November 2014. However, TCE has not been detected in indoor air samples. This property has a radon system installed.

Indoor air samples collected from many other residential properties contained TCE concentrations above the indoor air screening criterion for TCE. However, the corresponding sub-slab vapor samples at these properties did not contain TCE concentrations above the sub-slab vapor screening criterion. These residential properties include the locations of BYR-DW157, BYR-DW115, and BYR-DW114. Even though the BYR-DW115 property lacked a functioning SSDS during the January 2014 sampling event, the sub-slab vapor concentrations were still below the screening criterion for TCE. A maximum TCE concentration of 2.4 μg/m³ was detected at the property associated with BYR-DW157 in November 2014. This property does not have a vapor mitigation system installed. At the property associated with BYR-DW115, elevated TCE concentrations were observed in indoor air (basement) samples collected in January and April 2014 at 21 to 23 μg/m³, respectively. However, after the SSDS was installed at the property in January 2014, the property was resampled in August 2014 and the results showed indoor air TCE concentrations reduced to 2 μg/m³. TCE was also detected in indoor air at the property associated with BYR-DW114 fluctuating between up to 1.8 μg/m³ (January 2014) and nondetect (November 2014). This property has a radon system installed.

Elevated indoor air TCE concentrations exceeding the screening criterion were observed in only January 2014 at several residential properties. These properties included the locations of BYR-DW118, BYR-DW119, and BYR-DW131. At these locations, peak concentrations ranged between 0.97 and 1.8 μg/m³. However, other sampling events (before and after January 2014) at these properties revealed either very low TCE concentrations or no detections of TCE in indoor air.

PCE was detected in indoor air samples collected at the BYR-DW157 property close to the PCE indoor air screening criterion (10.8 μg/m³) at a concentration of 8.6 μg/m³ in 2012 and of 9.4 μg/m³ in 2014.

The 2011 and 2016 sampling events did not include testing for 1,4-dioxane. However, in the 2012 and 2014 sampling events, sub-slab vapor samples did not exceed the screening criterion for 1,4-dioxane (18.7 μg/m³). Most samples did not have any detections of 1,4-dioxane (18U μg/m³). In addition, 1,4-dioxane was not detected in any indoor air samples, but the detection limit was elevated (18U μg/m³ for most samples, 36U μg/m³ for one sample) above the screening criterion (0.562 μg/m³). However, based on the lack of 1,4-dioxane in sub-slab vapor, it is unlikely that 1,4-dioxane had impacted indoor air.

4.2.6.2 Recent Results

In January 2017, sub-slab vapor and indoor air sampling was conducted at mostly the same 16 properties that had previously been sampled in 2014. In January 2018, sampling was again conducted at 16 properties, but only 9 properties were the same locations as in the January 2017 event (BYR-DW113, BYR-DW114, BYR-DW115, BYR-DW120, BYR-DW124, BYR-DW125, BYR-DW127, BYR-DW129, and BYR-DW157), and 6 properties were only sampled for sub-slab vapor, not indoor air (BYR-DW128, BYR-DW132, BYR-DW135, BYR-DW136, BYR-DW137, and BYR-DW159).

The sub-slab vapor sample collected at the BYR-DW113 property with historically elevated TCE concentrations in sub-slab vapor showed declining TCE concentration from 20 µg/m^3 in 2017 to 6.10 µg/m^3 in 2018, which is significantly lower than observed historically (up to 1,400 µg/m^3) and below the sub-slab screening criterion of 16 µg/m^3. Indoor air TCE concentrations showed more variation than sub-slab vapor concentrations, consistently fluctuating between nondetect and exceeding the indoor air screening criterion.

Sub-slab vapor at the property associated with BYR-DW125 increased from 16 µg/m^3 in 2017 to 45 µg/m^3 in 2018. While elevated TCE concentrations have been increasing in sub-slab vapor, indoor air TCE concentrations have been declining since January 2014 to below the screening criterion of 0.48 µg/m^3 in 2018. Elevated concentrations of TCE in sub-slab vapor have persisted over time at the BYR-DW125 property. However, the decreasing indoor air concentrations reflect the effectiveness of the existing NJDEP-modified radon system.

In 2017, indoor air samples from the BYR-DW157 and BYR-DW115 properties contained TCE concentrations above the screening criteria while TCE concentrations in sub-slab vapor remained at trace levels or were not detected. In 2018, indoor air concentrations of TCE at the BYR-DW157 property decreased to nondetect. However, the TCE concentrations at BYR-DW115 still exceeded the indoor air screening criterion despite a decreasing trend (from a maximum of 4.2 µg/m^3 in 2017 to a maximum of 1.9 µg/m^3 in 2018) and despite persistently low concentrations of TCE in sub-slab vapor. Persistently elevated indoor air concentrations of TCE in the BYR-DW115 property without correspondingly elevated sub-slab concentrations suggest a potential indoor background source of TCE that may be affecting sampling results.

Sub-slab and indoor air concentrations at the other residential properties were either nondetect or below screening criteria in the 2017 and 2018 sampling events.

Only a subset of the sub-slab vapor samples collected in the 2017 event were also analyzed for 1,4-dioxane (at BYR-DW115, BYR-DW118, BYR-DW120, and BYR-DW130). All sample results remained below the screening criterion for 1,4-dioxane (18.7 µg/m^3). Indoor air samples were not tested for 1,4-dioxane, but based on the lack of 1,4-dioxane in sub-slab vapor, it is unlikely that 1,4-dioxane has impacted indoor air. No samples collected in the 2018 event were analyzed for 1,4-dioxane.

4.3 Other Contamination

This section summarizes other contaminants (besides VOCs) found in site media during the 2014 and 2017 investigations. Discussion of other contamination present in groundwater will focus on the November 2017 (Round 2 data) as it is the most recent comprehensive round of groundwater with samples collected for TCL and TAL analysis. Discussion of the other media (soils, sediments, and surface water) includes samples collected during both the 2014 and 2017 investigations.

The 2014 investigations included field screening of 148 locations for analysis of TAL metals using XRF and collection of soil gas samples for VOCs from 139 locations. These results were used to select sampling locations in the former dump areas, the drainage pathways, and residential areas adjacent to the site. Soils, sediment, and surface water samples were collected, which included TCL SVOC, PCB Aroclor, pesticide, and TAL metals sampling. The results from this sampling were compared to the site screening criteria and BTVs, and the results are included in Appendix I.

The subsections below are broken out by contaminant type and focus on contaminants that most frequently exceeded screening criteria.

4.3.1 SVOCs

This subsection describes the extent of SVOC contamination found at the site. It focuses on PAHs, a group of contaminants that were detected in soils in both the former dump areas and in sediments adjacent to the site and on 1,4-dioxane, which was found in site groundwater and surface water.

4.3.1.1 PAHs

PAHs were only detected above RI screening criteria in a limited number of soil samples collected in the former dump areas in 2014 and in the residential area soils collected in 2014 and 2017. The PAHs were more frequently above RI screening criteria in the sediment samples collected from the drainage areas adjacent to the site in 2014, but were not detected above screening criteria in site surface water or groundwater.

Former Dump Area Soils

PAHs were only detected above screening criteria in 2 of the 82 soil samples collected from borings during the 2014 investigation in and around the former dump areas. Dump area sampling found:

- Sample SB-13 collected from surface soils (0 to 1 ft bgs) in the center of Dump Area E contained the most elevated concentrations of PAHs including benzo(a)anthracene at 14,000J µg/kg, benzo(a)pyrene at 12,000 µg/kg, benzo(b)fluoranthene at 12,000J µg/kg, benzo(k)fluoranthene at 11,000 µg/kg, indeno(1,2,3-cd)pyrene at 9,500J µg/kg, and dibenzo(a,h)anthracene at 7,300J µg/kg. Results from a 2010 pre-excavation composite waste sample from Dump Area E (from 2 to 12 ft bgs) revealed trace levels of select SVOCs (e.g. benzo(a)pyrene at 49J µg/kg), but all detections were much lower than observed in the surface soil sample in 2014 (Weston 2010). This increase in PAHs at Dump Area E suggests the "clean excess soil" from Dump Area B that was used to backfill Dump Area E after the 2012 excavation may have contained localized PAH-contaminated soil.

- Sample SB-23 collected from surface soils (0 to 1 ft bgs) in the upper trench of Dump Area A was the only other sample with elevated concentrations of PAHs, including benzo(a)pyrene at 3,300J µg/kg, and dibenzo(a,h)anthracene at 530 µg/kg. Results from a 2010 pre-excavation composite waste sample from the upper trench of Dump Area A (from 0 to 8 ft bgs) did not have any detections of the most elevated concentration PAHs detected in the 2014 sample. Instead, the highest concentration was of naphthalene at 920 µg/kg (Weston 2010). Soil from the area around Dump Area A was used to backfill the upper trench after excavation in 2012, but it is likely that PAH-contaminated soil was moved into the upper trench from the vicinity of the dump area.

Residential Area Soils

PAHs were only detected above screening criteria in 1 of the 16 soil samples collected from borings during the 2014 and 2017 investigations in the residential areas. That sample, SS-10, was collected from soils near the discharge of a storm sewer pipe and had PAH concentrations below the BTV for each analyte.

Figure 4-16 shows the concentration of benzo(a)pyrene in surface and subsurface soils. Benzo(a)pyrene was selected, as it most frequently exceeded screening criteria. The figure shows the extent of soils contaminated with PAHs is limited and confined generally to surface soils.

Sediments

PAHs were much more prevalent in sediments exceeding screening criteria in nearly every sample collected. However, PAH concentrations were only elevated above the BTVs calculated for sediment in one location, SED-11, collected in a swale adjacent to the former railroad bed. The sample at this location found extremely elevated concentrations of numerous PAHs including fluoranthene at 120,000 µg/kg, pyrene at 61,000 µg/kg, chrysene at 43,000 µg/kg, benzo(a)anthracene at 43,000 µg/kg, and benzo(a)pyrene at 35,000 µg/kg. This location also found elevated dibenzofuran at 510 µg/kg, likely related to the materials that contained the elevated PAHs. SED-11 is downslope from Dump Area D, but the PAH concentrations in this sediment sample are much higher than those found in site soils.

Figure 4-17 shows concentrations of benzo(a) pyrene in sediment as it most frequently exceeded screening criteria in media at the site. Benzo(a) pyrene (and the other PAHs) are all more elevated in the sediments collected within the former railroad bed. This includes the background sediment location BSED10 that was collected within the former railroad bed upstream from the site and the SED-10 location. Concentrations decrease significantly in the sediments of Cowboy Creek, although there are a few locations above the RI screening criteria.

The soil and sediment PAH data suggest only minor isolated impacts related to site dumping. The highest concentrations of PAHs found in the former railroad bed area are likely related to the rail ties or other processes that left behind these materials (not site-related).

4.3.1.2 1,4-Dioxane

Similar to the CVOC contamination described in Section 4.2 above, 1,4-dioxane was detected in most the of groundwater samples collected during the November 2017 (Round 2) and January 2018 (Round 3) sampling events.

1,4-dioxane was detected in 74 of the 89 groundwater samples collected in November 2017, with concentrations ranging from 0.086J to 4.1 µg/L, with 32 of the samples exceeding the RI screening criteria of 0.4 µ g/L. Concentrations in the January 2018 sampling event were similar, with 1,4-dioxane exceeding screening criteria in 7 of 42 wells sampled, with a maximum concentration of 2.3 µg/L.

Maximum detections were in the wells screened below the former dump areas, and the overall extent of the 1,4-dioxane appears similar to that of the CVOC contamination observed. 1,4-dioxane, like TCE, was detected in the surface water at low concentrations (up to 0.12J µg/L) but well below the RI screening criteria of 22,000 µg/L.

Slightly elevated concentrations suggest the site as a possible source, but due to the low concentrations detected, this is a secondary concern to the CVOC contamination. 1,4-dioxane is used as a stabilizer in the production of chlorinated solvents which also contain CVOCs and is likely part of the original mix of septic waste that was dumped on-site.

4.3.2 Pesticides

Pesticides did not exceed RI screening criteria in site soils, surface water, or groundwater samples. Pesticides were found in sediments, but only above screening criteria for a limited number of chemicals. Samples only slightly exceeded screening criterion for gamma-chlordane (3.24 µg/kg) at a concentration of 7.5J µg/kg at the SED-11 location within the former railroad bed.

Pesticides were observed in the former dump area soils at higher concentrations than the surrounding areas (although still below the RI soil screening criteria). For example, 4,4'-DDT was observed in the surface soil samples taken from in and around Dump Area D (at concentrations ranging from 4.4J to 160 µg/kg), which is upslope from the SED-11 sample location. This could be indicative of contamination potentially moving from the dump areas to the sediments. However, the contamination at SED-11 may also be from historical contaminated runoff from Dump Area D where 2010 pre-excavation composite waste sampling results indicated elevated concentrations of gamma-chlordane (69 µg/kg), 4,4'-dichlorodiphenyldichloroethylene (4,4-DDE) (27 µg/kg), and 4,4'-DDT (290J µg/kg) among other pesticides. Post-excavation sampling confirms that pesticide-contaminated soil above RI screening criteria has been removed from Dump Area D, and the magnitude of the concentrations in the sediments does not suggest this is anything more than an isolated exceedance.

4.3.3 Polychlorinated Biphenyls

PCBs were detected in soils in both the former dump areas and the adjacent residential area. PCBs were not detected in other site media including sediments, surface water, or groundwater during the 2014 or 2017 investigations.

<u>Former Dump Area Soils</u>

Several PCB Aroclors were detected in soil samples collected from borings during the 2014 investigation in and around the former dump areas. Sampling results for PCBs in the dump areas are compared to 2010 pre-excavation composite waste sampling results below:

- Aroclor 1254 was detected in 23 of 92 samples; 11 exceeded the RI screening criteria of 200 µg/kg, with a maximum of 2,100 µg/kg at SB-41 (0 to 1 ft bgs). Only two surface soil samples and one deeper (3 to 5 ft bgs) sample exceeded the New Jersey Non-Residential Direct Contact Cleanup Criteria of 1,000 µg/kg. Results from pre-excavation samples also showed elevated concentrations of Aroclor-1254 in Dump Area A and D (ranging from 740 µg/kg to 8,000J µg/kg). The elevated pre-excavation PCB concentrations in the former dump areas and the largely shallow (less than 2 ft deep) contamination detected post-excavation suggest that while the 2012 excavation removed the most PCB-contaminated soils (located inside the former dump areas), spots of PCB contamination were distributed around the former dump areas, which may have been added back into select locations of the former dump areas during backfilling.

- Aroclor 1260 was detected in 20 of 92 samples; 7 exceeded the RI screening criteria of 200 µg/kg, with a maximum of 2,400 µg/kg at SB-41 (0 to 1 ft bgs). Only two surface soil samples exceeded the New Jersey Non-Residential Direct Contact Cleanup Criteria of 1,000 µg/kg. Pre-excavation sampling results indicated only one detection of Aroclor 1260 in Dump Area B (100J µg/kg), which suggests that the Aroclor 1260 contamination was and remains outside but in the vicinity of the former dump areas.

Residential Area Soils

PCB Aroclors were detected in soil samples in the residential areas during both the 2014 and 2017 investigations. These samples were collected from surface soils (less than 2 ft bgs). Residential area sampling found:

- Aroclor 1254 was detected in 18 of 38 samples; 11 exceeded the RI screening criteria of 200 µg/kg, with a maximum of 2,800 µg/kg at HA07 (0 to 1 ft bgs).

- Aroclor 1260 was detected in 20 of 38 samples; 10 exceeded the RI screening criteria of 200 µg/kg, with a maximum of 1,800 µg/kg at HA17 (0 to 1 ft bgs).

Figure 4-18 shows the concentrations of Aroclor 1254 in both shallow (less than 2 ft bgs) and deeper soil samples. Sampling in the former dump areas only found sporadic hits and exceedances of the RI screening criteria. Generally, the PCBs where found, are confined to the upper 2 ft of soils and are concentrated in an area north of Dump Area A and continue downslope into the rear (southern) portion of a residential property on Brookwood Road (location of the BYR-DW120 residential well). This area was investigated in November 2014 during a step-out sampling event in response to PCBs and metals contamination found in the initial EES JV source area DPT investigation (in November and December 2013).

The slope where the highest concentrations of PCBs are found is generally steep and only has a few feet of overburden above the bedrock surface. The extent of contamination does appear to be confined to the slope with samples collected in the residence's primary backyard and the adjacent properties below screening criteria.

This data and topography suggests PCB-containing materials may have been dumped in or around Dump Area A and may have migrated via surficial runoff or movement of fine grained materials down the steep slope and onto the residential property.

4.3.4 Metals

This subsection summarizes detections of metals in site media during the 2014 and 2017 investigations. The section focuses on those metals that were found above screening criteria.

4.3.4.1 Lead and Chromium

Lead and chromium were both detected above RI screening criteria in soil samples from the former dump areas and the adjacent residential area. Both metals were detected in sediments and surface water.

Former Dump Area Soils

Lead and chromium were detected in soil samples collected from borings during the 2014 investigation (both XRF screening samples and soil boring samples) in and around the former dump areas. Sampling results for metals in the dump areas are compared to 2010 pre-excavation composite waste sampling results below:

- Lead exceeded the RI screening criteria of 400 mg/kg in 1 of 92 laboratory samples, with a maximum of 442 mg/kg at SB-41 (0 to 1 ft bgs), and in 2 of 128 XRF samples, with a maximum of 601 mg/kg at J900 (0 to 0.5 ft bgs). Only surface soil samples (less than 2 ft bgs) exceeded screening criteria and none exceeded the New Jersey non-residential direct contact soil remediation standards of 800 mg/kg. Lead concentrations in the pre-excavation samples were largely under 200 mg/kg except for a sample in Trench 3 of Dump Area D (401J mg/kg). Similar to the distribution of Aroclor 1260, lead contamination appears highest around the former dump areas, not within the dump areas.

Chromium exceeded the RI screening criteria of 0.4 mg/kg in 91 of the 92 laboratory samples, with a maximum of 51.4 mg/kg at HA11 (0 to 1 ft bgs), and in 123 of the 128 XRF samples, with a maximum of 72 mg/kg at J900 (0 to 0.5 ft bgs). Only 14 laboratory samples found concentrations above the BTV that was calculated for chromium (24.2 mg/kg), and only two of those were in subsurface soils below 2 ft. Chromium concentrations in the pre-excavation samples were greater than 0.4 mg/kg for all dump areas sampled (A, B, D, and E), with concentrations ranging from 6.5 to 29.6 mg/kg. However, similar to the distribution of Aroclor 1260 and lead, chromium contamination appears highest outside of the former dump areas.

Residential Area

Lead and chromium were detected in soil samples in the residential areas during both the 2014 and 2017 investigations. These samples were collected from surface soils (less than 2 ft bgs). Residential area sampling found:

- Lead exceeded the RI screening criteria of 400 mg/kg in 7 of 38 laboratory samples, with a maximum of 1,460 mg/kg at SB-42 (0 to 1 ft bgs), and in 2 of 16 XRF samples, with a maximum of 528 mg/kg at H800 (0 to 0.5 ft bgs).

- Chromium exceeded the RI screening criteria of 0.4 mg/kg in all 38 laboratory samples, with a maximum of 278 mg/kg at HA09 (0 to 1 ft bgs), and in all 16 XRF samples, with a maximum of 66 mg/kg at I700 (0 to 0.5 ft bgs). Only 10 laboratory samples had chromium concentrations above the BTV that was calculated for chromium (24.2 mg/kg), and all were in the same general area.

Figures 4-19 and 4-20 show the concentrations of lead and chromium in both shallow (less than 2 ft bgs) and deeper soil samples. In the former dump areas, there were sporadic exceedances of the RI screening criteria for lead, which was generally confined to the upper 2 ft of soils. Similarly, elevated chromium concentrations were primarily in the surface soils and, with exception of a few samples, chromium is not elevated more than three times the BTV of 24.2 mg/kg. Those locations are found coincident with elevated lead and PCBs.

Much like the PCBs, the most elevated lead and chromium concentrations are concentrated in an area north of Dump Area A and continue downslope into the rear (southern) portion of a residential property on Brookwood Road (location of the BYR-DW120 residential well). The extent of contamination does appear to be confined to the slope with samples collected in the residence's primary backyard and the adjacent properties below screening criteria.

Like the PCBs, this data and topography suggests materials containing lead and chromium may have been dumped in or around Dump Area A and may have migrated via surficial runoff or movement of fine grained materials down the steep slope and onto the residential property.

Sediments, Surface Water, and Groundwater

Lead and chromium were detected in the sediments and surface water sampled at the site during the 2014 investigations and in the groundwater samples collected during 2014 and November 2017 investigations. Sampling found:

- Lead exceeded the screening criteria of 31 mg/kg in 3 of 12 sediment samples, with a maximum concentration of 76.8 mg/kg at SED11. This concentration however was below the BTV of 131.1 mg/kg calculated for lead in sediments. In surface water, lead only slightly exceeded the screening criteria of 5 µg/L in one of 11 samples (6.1 µg/L at SW-05). This sample was narrowly above the BTV (5.95 µg/L) for lead in surface water. In the 2017 groundwater samples, lead only slightly exceeded the RI screening criteria of 5 µg/L in one of three samples with the maximum concentration of 9.5 µg/L found in MLS-13. During the 2014/2015 groundwater sampling, lead also exceeded the screening criteria in 13 of 102 samples, with a maximum concentration of 22.8 µg/L at MLS-7-P1. Only 2 of the 102 samples were more than 10 µg/L (twice the screening criteria). No BTVs were available for groundwater.

- Chromium did not exceed the screening criteria of 26 mg/kg in any of the 12 sediment samples collected. In surface water, chromium was detected as high as 127 µg/L, and 2 of the 11 samples exceeded the screening criteria of 10 µg/L.. Chromium was not detected in the groundwater samples collected during 2017 and was only detected above the screening criteria of 70 µg/L in one well (MLS-3-P2 at 622 µg/L) during the 2014 sampling.

The lead and chromium data from the media other than soils do not suggest significant impacts related to site dumping, but rather natural background conditions for the creeks. Although no, BTVs were available for groundwater, concentrations of lead and chromium do not appear to be significantly elevated to be of concern as the elevated concentrations appear to be localized and sparse rather than widespread.

4.3.4.2 Other Metals

There were several other metals besides lead and chromium that were detected above RI screening criteria in soils, sediment, surface water, and groundwater. These metals either exceeded criteria in few locations or were found below the BTV calculated based on the background samples. No additional metals were found above screening criteria in site groundwater.

Soils

In soils, the only other metals found above screening criteria were arsenic and antimony. The exceedances for both metals were limited to a surface soil sample, SB-42, which was also the location of the maximum lead concentration at the site.

Groundwater

In groundwater, no other metals exceeded the RI screening criteria during 2017 sampling. During the 2014/2015 sampling aluminum, arsenic, iron, manganese, and nickel exceeded the RI screening criteria. Generally, these metals exceeded criteria in a limited number of samples or are not typically considered groundwater contaminants (manganese and iron).

Sediments

Several metals were detected above the RI screening criteria in sediment samples. Several metals, including barium, manganese, iron, zinc, copper, arsenic, nickel, and cadmium, exceeded the screening criteria in multiple samples, but concentrations were all below the BTVs or within the range of the concentrations detected in background samples.

Surface Water

Several metals were detected above the RI screening criteria in surface water samples. Several metals, including arsenic, manganese, aluminum, and iron, exceeded the screening criteria in multiple samples, but concentrations were all below the BTVs calculated based on the background surface water samples collected.

The other metal found above its screening criteria in surface water was cadmium, which was detected in 2 of 21 samples, one of which slightly exceeded the RI screening criteria of 0.2 µg/L. Cadmium was not detected in background samples; therefore, no BTV was calculated. However, the maximum concentration detected of 0.86J µg/L is likely not significantly elevated to be of concern.

Section 5

Contaminant Fate and Transport

This section discusses the chemical and physical processes that affect the fate and transport of the SRCs in soil, groundwater, porewater, and surface water at the site. An understanding of the fate and transport of contaminants aids the evaluation of potential current and future exposure risks and the evaluation of remedial technologies in the FS.

This section provides the following:

- A summary of the relevant physical-chemical properties and mobility of the SRCs
- A discussion of processes that affect the fate of the SRCs in the environment
- A discussion of processes that affect the transport potential of the SRCs
- An evaluation of MNA
- A site-specific fate and transport summary
- A presentation of the CSM

5.1 Site-Related Contaminants

Section 4 presented the results of screening all detected contaminants against both the site-specific screening criteria and the calculated BTVs. The discussion confirmed that the primary SRCs are the CVOCs, particularly TCE since it is the most widespread SRC across the numerous media sampled. Section 5 focuses primarily on the CVOCs. Other SRCs identified in Section 4 included 1,4-dioxane, metals, and PCBs. These other SRCs are discussed in Section 5.6.

Other contaminants not selected as SRCs included the following:

- PAHs are not further discussed in this section as they were detected above RI screening criteria in only a limited number of soil and sediment samples (as discussed in Section 4). Only two soil samples exhibited concentrations of PAHs above the calculated BTV in isolated locations in the former dump area surface soils (0 to 1 ft bgs). High concentrations of PAHs were found in sediment near a former railroad bed which suggests a likely offsite source (railroad activities) for this sediment contamination.

- Similarly, pesticides were only observed sediment in the same location as the high concentrations of PAHs. The same offsite source may have contributed to the pesticides contamination. Pesticides did not exceed RI screening criteria in any other media.

5.2 Chemical and Physical Properties of VOC SRCs

The chemical properties of the VOC SRCs are presented in Table 5-1.

To predict their fate, persistence, and potential transport, it is necessary to identify how likely they are to migrate or degrade. These processes depend on the physical and chemical properties of each contaminant, and the properties of the media through which they migrate.

Specific Density

The specific density is the ratio between the density of the actual component and the density of water. The density is measured as dry mass per volume (gram per cubic millimeter). The density of a contaminant predicts its ability to float on, or sink in, water in an undissolved phase. The primary SRCs with specific densities greater than 1 (e.g., TCE and cis-1,2-DCE) are known as DNAPLs and can move downward, through the unsaturated zone to the groundwater table, under the influence of gravity (Table 5-1). Depending on the solubility of the constituents of the DNAPL, some of the DNAPL mass may dissolve in groundwater and then move with groundwater flow. If sufficient DNAPL mass is present, the remaining free-phase fraction will continue to migrate downward through the saturated zone until it encounters a low permeability layer where it can pool and provide a continuous source of dissolved VOCs to groundwater.

Water Solubility

The solubility of a chemical is defined as the upper limit of its dissolved concentration in water at a specified temperature. Concentrations exceeding a chemical's solubility may indicate sorption onto soils, a co-solvent effect, or the presence of DNAPL.

Because of their relatively low solubility in water, the rates of dissolution of the primary SRCs are likely to be low (Table 5-1). However, because of their high density and low viscosity, the SRCs can migrate downward into aquifers if they are in the nonaqueous phase. Once in groundwater, the solubility of the SRCs is sufficiently high to cause significant aqueous-phase contamination, but also sufficiently low to provide a persistent source (Johnson and Pankow 1992). However, as DNAPL moves through the unsaturated zone, it is often distributed in a discontinuous mass of globules referred to as residual DNAPL. As DNAPL passes through soil, some of it is retained within the soil pores by capillary forces. The distribution of residual DNAPL is often variable and depends on the type and structure of the soil. The mobility of residual DNAPL in soil is low, but DNAPL can still act as a continuous source of contamination. Pools or puddles of free-phase DNAPL are seen much less frequently than residual DNAPL (Interstate Technology Regulatory Cooperation [ITRC] 2000). DNAPL that penetrates bedrock generally continues to migrate downward through fracture networks until the driving head in the DNAPL has been dissipated and becomes immobile. DNAPL will gradually dissolve into groundwater within fractures and the rock matrix but can also become trapped in dead-end fractures. The dissolved-phase material migrates with the water flowing through fractures forming a plume downgradient of the release area. As the plume migrates, molecular diffusion can occur from the plume within fractures into the matrix porosity (ITRC 2015).

Vapor Pressure

Vapor pressure is the pressure exerted by a chemical vapor, at a given temperature, in equilibrium with its solid or liquid form. It is used to calculate the rate of volatilization of a pure substance from a surface or to estimate a Henry's Law constant for chemicals with low water solubility. The higher the vapor pressure, the more likely a chemical is to exist in a gaseous state. Compounds with high vapor pressures are categorized as volatile. The primary SRCs are volatile compounds and have moderate to moderately high vapor pressures indicating that they can evaporate quickly from soil or water under normal atmospheric temperatures and pressures (**Table 5-1**). Evaporation will tend to increase with increasing temperature.

Henry's Law Constant

Henry's Law constant provides a measure of the extent of chemical partitioning between air and water at equilibrium. The higher the Henry's Law constant, the more likely a chemical is to volatilize from water to air. Under the influence of pressure gradients, VOCs that volatilize from groundwater can migrate through soil pore spaces and preferential pathways and potentially impact buildings above the plume (Table 5-1).

Organic Carbon Partition Coefficient

The organic carbon partition coefficient (K_{oc}) provides a measure of the extent of chemical partitioning between organic carbon and water at equilibrium. The higher the K_{oc}, the more likely a chemical is to bind to organic carbon in soil or sediment rather than remain dissolved in water. The K_{oc} values of the primary SRCs are relatively low (less than 100 milliliters per gram [mL/g]) indicating that they tend to partition into the water phase and are likely to be highly mobile in water and unlikely to bind to soil (Table 5-1).

Octanol-Water Partition Coefficient

The octanol-water partition coefficient (K_{ow}) provides a measure of the extent of chemical partitioning between water and octanol at equilibrium. The greater the K_{ow}, the more likely a chemical is to partition to octanol rather than to remain in water. Octanol is used as a surrogate for lipids, and the K_{ow} is used to predict the rate of bioaccumulation in living organisms. All the primary SRCs have relatively low K_{ow} (below 4), indicating that they have low potential to bioaccumulate in organisms (Table 5-1).

5.3 Environmental Fate of VOC SRCs

Contaminant fate describes the length of time a specific chemical will remain in its original state in the environment. The fate of the SRCs discussed in this section.

The major processes that affect the fate or persistence of the SRCs are volatilization, biodegradation, dissolution, and abiotic degradation. The most persistent chemicals are those that volatilize, biodegrade, dissolve, or hydrolyze slowly.

5.3.1 Processes that Affect Fate

Volatilization is the conversion of a liquid or solid to a gas or vapor by application of heat, by reducing pressure, by chemical reaction, or by a combination of these processes. A chemical's volatility is measured with the Henry's Law constant and vapor pressure.

Biodegradation is the breakdown of organic contaminants by microbial organisms into smaller compounds through metabolic or enzymatic processes. Biodegradation processes vary greatly, but frequently the final product of degradation is carbon dioxide or methane. Biodegradation is inherently a biological process mediated by bacteria, and thus biodegradation of contaminants will only occur if the site conditions are such that a population of degrading microbes can be sustained.

Dissolution is the process of dissolving, changing, or separating a substance into component parts or changing it from a solid to a solution. Mechanisms that cause or enhance dissolution include solution by heat, moisture liquefaction, melting, or decomposition.

Abiotic degradation is the chemical transformation that degrades contaminants without microbial facilitation. CVOCs dissolved in groundwater also may be degraded by abiotic mechanisms. The most common reactions affecting chlorinated compounds are hydrolysis (a substitution reaction) and dehydrohalogenation (an elimination reaction). Abiotic degradation can result in partial or complete degradation of contaminants. Abiotic degradation rates typically are much slower than biodegradation rates.

5.3.2 Site-Specific Fate of SRCs

The site-specific fate of CVOCs is driven primarily by their ability to volatilize and degrade, as discussed below.

TCE

Under atmospheric conditions, TCE is expected to be present primarily in the vapor phase rather than sorbed to particulates because of its high vapor pressure. Some removal from air during precipitation events is expected due to the solubility of TCE in water. The major degradation process affecting vapor phase TCE is photo-oxidation by hydroxyl radicals; the half-life for this reaction in air is estimated to be seven days (Hazardous Substance Databank [HSDB] 2012).

The dominant fate of TCE in surface water is volatilization with a predicted half-life of minutes to hours. Henry's law constant for TCE indicates that partitioning from water to air is likely (USGS 2002). TCE in surface water may degrade via aerobic biodegradation, but rates are unknown. TCE's ability to bioconcentrate or sorb to suspended solids and sediments is low based on its log K_{ow} value (2.4) and its K_{oc} value (61 mL/g).

The dominant fates of TCE in soils are dissolution and volatilization. Because of its moderate solubility, TCE has the potential to migrate through the soil and into groundwater. Precipitation and snowmelt percolating through the unsaturated zone can dissolve TCE and transport it to groundwater. TCE is moderately soluble in groundwater (1,280 mg/L). However, this solubility is four orders of magnitude greater than the New Jersey Groundwater Quality Standard of 1 µg/L.

TCE degradation in groundwater is variable and depends on many factors, including geochemical conditions in the aquifer (particularly redox conditions), the presence of appropriate microorganisms, the presence of electron donors, and other factors. The potential for biodegradation of primary SRCs under site-specific conditions is discussed in Section 5.4.

Due to its low molecular weight, moderate water solubility, and high vapor pressure, TCE in soil and groundwater (particularly in the unsaturated zone and shallow perched groundwater) can partition into the gaseous phase and migrate as vapor. TCE has the potential to accumulate beneath structures or foundations and migrate into interiors of structures via advection and convection transport mechanisms and preferential pathways.

Prior to excavation, TCE was detected in the source areas at concentrations over 20,000 mg/kg and contamination was found in Dump Areas A, B, D, and E. However, TCE has been largely removed from the overburden source areas during the excavation removal action in 2012 and only trace concentrations remain in Dump Area E (maximum of 25J µg/kg). Minimal detections of TCE were found in the overburden groundwater in the former dump areas as well. The majority of TCE contamination remaining is in the fractures of the bedrock below the former dump areas. Sufficient residual TCE is present in the bedrock fractures for groundwater contamination to still be present after the excavations. TCE was detected in groundwater at concentrations up to 180 µg/L in the upper portion of the saturated bedrock (nearly 65 to 80 ft bgs) below Dump Area A. Groundwater in the bedrock below Dump Area D also had elevated TCE concentrations at 18 µg/L at approximately 119 to 135 ft bgs (MLS-7).

From the bedrock zone below the source areas, TCE has migrated through bedrock groundwater fractures into the overburden and bedrock groundwater system below the residential and Cowboy Creek areas where it has been detected at up to 11 µg/L in the shallow overburden wells and up to 63 µg/L in the residential bedrock wells. This is consistent with the understanding that groundwater transports contamination in numerous directions through a complex system of fractures propagating away from the elevated bedrock ridge where the former dump areas were located.

Cis-1,2-DCE

Under atmospheric conditions, cis-1,2-DCE is expected to be present primarily in the vapor phase rather than sorbed to particulates because of its high vapor pressure. The major degradation process affecting vapor phase 1,2-DCE is photo-oxidation by hydroxyl radicals; the half-life for this reaction in air is estimated to be 6 to 7 days (HSDB 2012).

The dominant fate of cis-1,2-DCE in surface soils is dissolution and volatilization. Because of its solubility, cis-1,2-DCE has the potential to migrate through the soil into groundwater. Biodegradation in soil and groundwater may occur at a relatively slow rate with half-lives on the order of months to 10 years (HSDB 2012).

The dominant fate of cis-1,2-DCE in surface water is volatilization, with a predicted half-life of minutes to hours. 1,2-DCE's ability to bioaccumulate or to sorb to suspended solids and sediments is low based on its log K_{ow} value and K_{oc} value.

Cis-1,2-DCE is most typically a product of the biodegradation of TCE. It may degrade via aerobic biodegradation Under anaerobic conditions, cis- 1,2-DCE is slowly biodegraded via reductive dechlorination; however, the extent and rate of degradation are dependent upon the strength of the reducing environment (HSDB 2012). Cis-1,2-DCE is soluble in groundwater, and sorption to organic matter can retard its movement through the aquifer. Its Henry's Law constant indicates that partitioning from water to air is likely.

Due to its low molecular weight and high vapor pressure, cis-1,2-DCE in soil and groundwater, particularly in the unsaturated zone and shallow perched groundwater, can partition into the gaseous phase and migrate as vapor. It has the potential to accumulate beneath structures or foundations and migrate into interiors of structures via advection and convection transport mechanisms and preferential pathways.

Prior to excavation, cis-1,2-DCE was detected at elevated concentrations in Dump Areas A, B, D, and E. However, cis-1,2-DCE has been largely removed from the overburden soil source areas during the excavation removal action and only trace concentrations remain in Dump Area E (maximum of 450 µg/kg). Cis-1,2-DCE was detected in bedrock groundwater below the former dump areas, at concentrations up to 230 µg/L below Dump Area D.

Similar to TCE, cis-1,2-DCE has migrated through bedrock groundwater fractures into the overburden and bedrock groundwater system below the residential and Cowboy Creek areas where it has been detected at up to 3.4 µg/L in the shallow overburden wells.

5.4 Environmental Transport of VOC SRCs

This section discusses the conditions at the site that may affect contaminant transport, potential contaminant transport pathways, potential contaminant transport mechanisms, and transport properties in soil. Potential migration mechanisms for site contaminants present in soil include leaching to groundwater, volatilization/fugitive dust, advection, dispersion, diffusion, recharge/dilution, retardation, discharge to surface water, and bioaccumulation.

5.4.1 VOC SRCs in Soil

It is assumed TCE and cis-1,2-DCE were released directly to the ground surface in the dump areas either as nonaqueous phase product or dissolved in septic waste, wastewater, or wash water. Potential migration mechanisms for TCE in soil include leaching to groundwater, volatilization, surface runoff, and degradation.

5.4.1.1 Leaching to Groundwater

TCE and cis-1,2-DCE were contained in waste materials disposed in the dump areas. Rainwater percolating through the waste material leached contamination into the percolating rainwater, transporting contaminant mass downward. Detections in groundwater indicate that leaching of TCE and cis-1,2-DCE from soil to groundwater occurred at the site in the past. Although the original source waste materials and overburden soils have been removed through the 2012 excavation removal action, groundwater concentrations are still above criteria, indicating that there may be residual mass in the vadose zone continuing to leach to groundwater.

5.4.1.2 Volatilization

Volatilization is another transport process for CVOCs in soil. Due to their low molecular weights and moderate vapor pressures, TCE and cis-1,2-DCE in the groundwater can partition into the gaseous phase and migrate as vapor. These SRCs can volatilize into the atmosphere or within the pore spaces in the unsaturated zone where they can migrate under the influence of pressure gradients, accumulate under foundations, and intrude into structures such as homes and buildings, a phenomenon known as vapor intrusion.

Elevated TCE concentrations in vapor have been consistently observed in select residences downgradient of the former dump areas. These residences have had an SSDS or a radon system installed to address vapor intrusion issues. Even so, concentrations of TCE were detected at up to 1,400 µg/m^3 (January 2014) in sub-slab vapor and up to 8.6 µg/m^3 (January 2014) in indoor air. The residences where TCE has been observed to exceed residential screening criteria for sub-slab vapor and indoor air generally correlate with overburden wells where TCE groundwater contamination is observed.

Cis-1,2-DCE has been detected occasionally at trace concentrations, but below its respective residential screening criteria for sub-slab vapor and indoor air.

5.4.2 VOC SRCs in Groundwater

The CVOCs likely reached the groundwater zone at the site either dissolved in rainwater, dissolved in wastewater/wash water released in a source area, or potentially as a limited release of DNAPL. The mechanisms that govern contaminant transport in the groundwater flow regime (i.e., solute transport) include advection, dispersion, diffusion, dilution, retardation (primarily via adsorption), volatilization, and degradation.

5.4.2.1 Advection

Advection describes the process of solute migration, which, due to the average bulk movement of groundwater, is typically the most important factor governing the transport of contaminants in groundwater. Groundwater generally flows from regions of the subsurface where the water level is high to regions where the water level is low.

5.4.2.2 Dispersion

Dispersion describes the spread of contaminants around an average groundwater flow path, beyond the region they would normally occupy due to advection alone. Dispersion is the sum of two processes: mechanical mixing and molecular diffusion. Mechanical mixing occurs because of local variations in groundwater velocity and the aquifer's matrix. Molecular diffusion results from variations in solute concentrations within the groundwater system (Mackay et al. 1985).

Dispersion and spreading during transport result in the dilution of contaminant plumes and the attenuation of concentration peaks; the maximum concentrations diminish with increasing distance from the source. Dispersion is expected to be important at the site. The hydraulic conductivity increases with depth in the bedrock; the increasing permeability results in more mechanical mixing.

5.4.2.3 Diffusion

Diffusion results from the movement of chemicals from higher concentration zones to lower concentration zones. Diffusion is dependent on concentration gradients. This mechanism will occur even in materials with low hydraulic conductivities, although diffusion becomes limited as matrix porosity decreases. Diffusion as a contaminant migration mechanism is most important when groundwater velocities are low, typically less than a few centimeters a year. This may be the case in low transmissivity bedrock fractures, or in saturated fractures with stagnant groundwater.

Diffusion allows the migration of contaminants out of the flow path of transmissive zones and into adjacent less permeable matrices, such as clayey particles or rocks and low-permeability pockets in the bedrock. When concentrations in groundwater decrease due to natural processes, migration of the plume, or remediation, back diffusion of contaminants from low-permeability matrices can become an important process for sustaining contaminant concentrations above the screening criteria. Contaminants diffuse out of the low permeability material (an explanation for contaminant "rebound") and into groundwater, thereby renewing contaminant plumes. Although diffusion can also spread contaminants longitudinally and transversely, given the molecular scale of spreading, the amount of spreading is significantly less than dispersion.

A study of matrix diffusion in site bedrock was conducted prior to this RI. The results did not indicate that matrix diffusion is pervasive at the site. These conclusions make sense, considering the hard, crystalline characteristics of the bedrock (matrix diffusion is typically more important in bedrock with higher primary porosity, such as sandstone, or in clay).

5.4.2.4 Dilution (recharge)

Contaminant concentrations in groundwater can be attenuated through dilution when additional water enters the system due to infiltration of precipitation.

5.4.2.5 Retardation

Dissolved contaminants may interact with aquifer solids encountered along the flow path via adsorption, partitioning (especially into organic carbon), ion-exchange reactions, and other chemical and physical processes that remove the dissolved constituents from groundwater. These interactions distribute the contaminants between the aqueous phase and the aquifer solids, diminish concentrations of the contaminants in the aqueous phase, and retard the movement of contaminants relative to groundwater flow (MacKay et al. 1985). The higher the fraction of a contaminant that is sorbed, the more its transport is retarded relative to the flow of groundwater.

Given that the TCE and cis-1,2-DCE contamination is largely in bedrock, the contaminant migration is expected to be minimally affected by retardation in the rock matrix.

5.4.2.6 Volatilization

CVOCs can volatilize when the groundwater discharges to surface water and, when present at the top of the water table, into the air-filled porosity of the overlying unsaturated zone. However, CVOCs in deeper groundwater that has no contact with unsaturated zones is unlikely to volatilize.

5.4.3 SRCs in Surface Water

Surface water samples exhibited TCE at low concentrations (0.15 µg/L at SW-03) at one downgradient surface water point. This suggests TCE has migrated from the overburden groundwater downgradient of the source areas into the Cowboy Creek wetland area, discharging to the creek at relatively low concentrations. Once in the surface water, TCE will volatilize into the atmosphere. TCE concentrations will decrease with increasing distance downstream from the source due to volatilization and dilution. Cis-1,2-DCE has been detected at low concentrations in the same location (0.3 µg/L at SW-03), mirroring the extent of TCE contamination.

5.5 Natural Attenuation of VOCs

Natural attenuation refers to the naturally occurring processes in soil and groundwater that affect the fate and transport of organic contaminants and achieve a reduction in the total mass, toxicity, mobility, volume, or concentration of contaminants. Under favorable conditions, these processes can be effective in containing and remediating contamination in a reasonable time. Natural attenuation may include biodegradation by subsurface microorganisms, abiotic reactions with naturally occurring minerals, and sorption on the geologic media that store groundwater in the subsurface. Since biodegradation is generally the most important natural process to reduce chlorinated organic chemical concentrations in groundwater, the following natural attenuation evaluation focuses on biodegradation.

Metals cannot be degraded into innocuous compounds; therefore, this section focuses on organic contaminants at the site.

5.5.1 Background on VOC Natural Attenuation Processes

Discharge of contamination from a source and biodegradation activity in the plume are the dominant factors that contribute to the persistence of a TCE plume. For TCE biodegradation to occur, the following subsurface requirements need to be met:

- Presence of a microbial population with the capabilities to degrade TCE
- Electron donor and a carbon source – Organic carbon is used both to provide an energy source (as electron donors) and to maintain and grow cells; for cometabolic reactions, methane is an important substrate.
- Electron acceptor – Electrons released by the biodegradation must be taken up by some other chemical.
- Nutrients – Certain nutrients are needed for the microbial population growth to occur (e.g., nitrogen, phosphorous, calcium, potassium, magnesium, and iron).

Biodegradation of chlorinated hydrocarbon compounds may occur through three different pathways, which are described below.

- **Electron Acceptor Reactions** – This process involves a reductive dechlorination reaction, during which the chlorinated hydrocarbon compound serves as electron acceptor, and a chlorine atom is replaced by a hydrogen atom. Concurrent with the degradation of the chlorinated hydrocarbon compound, the accumulation of less chlorinated daughter products and an increase of chloride ions will occur. Generally, the more chlorinated compounds are more susceptible to reductive dechlorination. For instance, PCE is the more susceptible to reductive dechlorination, followed by TCE, cis-1,2-DCE, and vinyl chloride (USGS 2002). Reductive dechlorination can occur under a range of reducing conditions; however, it occurs more rapidly under sulfate-reducing and methanogenic conditions, as opposed to nitrate-reducing and iron-reducing conditions (Bouwer 1994). A sufficient source of electron donors must be available to sustain microbial activity. This could be anthropogenic carbon such as petroleum hydrocarbons (e.g., BTEX), landfill leachate rich in organic content, or natural organic matter. Many microbes can dechlorinate TCE to cis-1,2-DCE, such as *Dehalobacter* and *Desulfitobacterium* spp.; however, the only microbe found to completely dechlorinate TCE to ethene/ethane is *Dehalococcoides spp*.
- **Electron Donor Reactions** – This process involves the transfer of electrons either from less chlorinated hydrocarbons such as vinyl chloride under aerobic and some anaerobic conditions. The reaction provides energy for microorganism growth and reproduction. It is

generally believed that PCE and TCE do not participate in such reactions as microorganisms cannot gain enough energy to sustain growth. As daughter products of PCE and TCE degradation (cis-1,2-DCE and vinyl chloride) occurring at source areas (often associated with more reducing conditions) are transported downgradient to less reducing conditions or even aerobic conditions by groundwater flow, they can be degraded through this pathway.

- **Cometabolism** – This process involves the incidental degradation of a CVOC catalyzed by an enzyme or cofactor that is fortuitously produced by microorganisms for other purposes. There is no known benefit to the microorganisms indirectly facilitating the cometabolism. The microorganisms indirectly transform the CVOC as they use either naturally occurring or other anthropogenic carbon sources—such as methane, propane, or phenol—as electron donors for energy. The enzymes particulate methane monooxygenase and soluble methane monooxygenase have been found to be facilitators of aerobic cometabolic degradation of chlorinated ethenes (Mattes et al. 2010).

5.5.2 VOC Monitored Natural Attenuation Evaluation

Natural attenuation processes that reduce VOC contaminant concentrations in soil and groundwater include destructive (e.g., biodegradation, abiotic degradation, and chemical reactions with other subsurface constituents) and nondestructive mechanisms (e.g., volatilization, dissolution, dilution/dispersion and adsorption/desorption).

During the RI investigation, MNA indicator parameters were collected from a subset of monitoring wells and analyzed in the field, EPA's DESA laboratory, or by subcontract laboratories to evaluate whether subsurface conditions are conducive to in situ natural degradation of CVOCs. MNA parameters included the following:

- Field parameters: pH, specific conductivity, dissolved oxygen, temperature, ORP, and ferrous iron
- Laboratory analysis: nitrate/nitrite, sulfate, sulfide, TOC, methane, ethane, ethene, CSIA, and microbiology

Results for the MNA parameters are included in Table 5-2 and discussed below.

5.5.2.1 Historical Concentration Trends

The limited historical dataset from monitoring wells does not allow a trend analysis. However, the residential wells do have a more robust dataset. As discussed in Section 4, there appears to have been a slight decreasing trend from 2005 until 2012. Concentrations from the 2013 sampling, which notably was 1 year after the source removal action on the ridge, generally increased compared to prior years, before appearing to decrease again. This spike could be an anomaly due to disturbance of a vadose zone source during excavation or drilling, which may have mobilized contamination into the system. That said, the pre-excavation downward trends may be a sign of natural attenuation and reduction of mass discharge from the source.

5.5.2.2 Evidence for Destructive Attenuation of SRCs

Compound Specific Isotope Analysis

CSIA was conducted at 14 wells during Round 2. CSIA measures the ratio of the C13 isotope to the C12 isotope of carbon in the TCE molecules present in the sample. Microbes find TCE containing the C13 isotope harder to degrade than TCE solely containing C12 because TCE with C13 is heavier. Therefore, if degradation is occurring, downgradient groundwater is more "enriched" with C13 compared to upgradient groundwater.

Figure 5-1 presents the results of the TCE CSIA sampling. TCE concentrations detected in the monitoring well samples (x-axis) are plotted against their C13/C12 isotope ratios (y-axis). Sample results with a higher C13/C12 ratio (e.g., toward 0 on the y-axis) suggests that preferential degradation using the C12 isotope has occurred, leaving the remaining TCE enriched with the C13 isotope. For the multiport wells (MLS), the sample from each port of the well is plotted separately with the port numbers increasing with depth. There are three conclusions from the chart:

1. In MLS-3 and MLS-4, the deepest sample is more enriched than the shallower samples, indicating biodegradation along the downward vertical flow path in these wells.
2. The downgradient wells along Brookwood Road (MLS-09, MW-10, MW-13, and MLS-09) are more enriched than the source zone wells (MLS-3 and MLS-4). This indicates degradation is occurring in groundwater between the shallowest ports of the source zone wells (e.g., where mass is discharging to groundwater from the vadose zone source) and the downgradient wells.
3. The conclusions regarding MLS-6 and MLS-7 are difficult to decipher. If the mass in these wells initially entered groundwater around MLS-3 and MLS-4, then the C13/C12 ratio at MLS-6 and MLS-7 could be interpreted as significant degradation. However, since these wells may be slightly side gradient to MLS-3 or MLS-4, the ratios could indicate that a different source (e.g., not Dump Area A) is impacting these wells.

For cis-1,2-DCE C13/C12 ratio (shown on Table 5-2), the differences in enrichment factors are less significant than for TCE. While some evidence of enrichment is observed at the deeper depths of MLS-3, in general, no significant difference is observed between upgradient and downgradient. Unlike TCE, the CSIA data for cis-1,2-DCE shows only limited biodegradation. However, given that concentrations of cis-1,2-DCE in general do not exceed the screening criterion, lack of cis-1,2-DCE degradation becomes less of a concern. Furthermore, the amount of parent product for cis-1,2-DCE (TCE) is not sufficient to indicate that buildup of cis-1,2-DCE would occur to the extent that the criterion would be elevated in the future.

There was insufficient vinyl chloride in all but one sample to allow CSIA for vinyl chloride. As shown on Table 5-2, vinyl chloride was only sporadically detected compared to its parent compounds, indicating that widespread buildup of vinyl chloride is not occurring. This may be due to degradation stalling at cis-1,2-DCE (as the CSIA data for cis-1,2-DCE suggests) in most wells. The exception is port 4 in MLS-3; as described below, this port has a significantly greater population of *Dehalococcoides spp.* compared to other wells, which is the only bacterium known to fully dechlorinate TCE through vinyl chloride to ethene.

Presence of Degradation Byproducts

The existence of degradation byproducts of the primary contaminant at the site (TCE) would indicate that biodegradation is occurring or has occurred at some point in the past. Cis-1,2-DCE is widespread at the site and represents a significant fraction of the total mass in the sampled wells. Vinyl chloride was detected sporadically. No ethane or ethene was detected, likely because of the relatively high reporting limits for these compounds compared to the concentrations of the parent compounds (e.g., degradation of low levels of vinyl chloride would likely yield ethane/ethene below the reporting limit).

Microbiology Results

The CSIA data indicate that degradation is significant at the deeper depths in MLS-3 and MLS-4, and that degradation occurs between the discharge to groundwater point(s) and downgradient wells. Microbiology samples were collected to determine if a microbial population is present that would explain the CSIA results and provide insight into the degradation pathway. There are three significant conclusions from the microbiology analysis:

1. *Dehalococcoides spp.* is present in source zone wells, especially at depth in MLS-3 where the CSIA data indicated significant degradation was occurring.

2. Enzymes for aerobic cometabolic degradation of chlorinated ethenes are present in the source zone (as is the presence of methane, which is used as a substrate for microbes involved in cometabolic degradation).

3. In general, downgradient wells (MW-9, MW-10, MLS-13, and MW-13) have much less microbial biomass in them compared to the source zone wells. This strongly suggests that the majority of biodegradation is near the former dump areas rather than downgradient.

Substrate for Microbial Catabolism and Metabolism

EPA guidance for natural attenuation suggests that organic carbon (natural or anthropogenic) concentrations exceeding 20 mg/L are sufficient to drive continuing biodegradation (EPA 1998). Total organic carbon was detected above the reporting limit of 1 mg/L in 2 of 14 wells. The maximum detection was 3.6 mg/L. Lack of organic carbon may be inhibiting sustained biodegradation in site groundwater. However, organic carbon is just one line of evidence for evaluating MNA. Methane is used by bacteria capable of aerobic cometabolism of TCE, and methane is present in groundwater across the source zone at concentrations up to 517 μg/L.

Presence of Redox Conditions Suitable for Biodegradation

The CSIA data and microbial data indicate that both the reductive dechlorination and the aerobic cometabolic degradation pathways are active at the site. Reductive dechlorination appears particularly important in the deeper bedrock, particularly around port 4 of MLS-3. In this port, the presence of methane indicates that the methanogenic redox conditions that *Dehalococcoides spp.* prefer for the complete dechlorination of TCE is present. The lack of nitrate/nitrite and relatively low sulfate also are indicators of reducing conditions suitable for *Dehalococcoides spp*.

Note that since the MLS wells are multi-port, measuring dissolved oxygen in these wells is difficult and therefore DO readings are considered somewhat unreliable and only one line of evidence for redox conditions.

Redox parameters indicate that redox conditions are less reducing in the shallower bedrock than the deeper bedrock. Based on ORP readings, there are also more oxidizing conditions downgradient. There is more nitrate/nitrite and sulfate and less methane in the shallower zones. However, methane is still present and usable as a substrate for microbes involved in aerobic cometabolic degradation of TCE.

Water Quality Parameters

The majority of samples collected at the site had pH between 6.0 and 8.0 and temperature between 9 and 12°C. Temperature and pH are not significant inhibitors of microbial activity at the site.

Abiotic Degradation

TCE can degrade via abiotic processes that do not create readily detectable intermediate byproducts. No data were collected to document this pathway; however, the hard, crystalline matrix of the bedrock on-site would typically not be expected to be significantly reactive since it lacks porosity and bedrock well samples reveal a general lack of ferrous iron (Table 5-2).

5.6.2.3 Evidence for Non-Destructive Attenuation of SRCs

Dilution and Dispersion

Dilution and dispersion are active attenuation mechanisms at the site, although potentially of limited importance given the low storativity of the bedrock aquifer. The source zone is unpaved and thus rainwater can infiltrate the subsurface. However, most rainwater travels in the overburden rather than infiltrating the bedrock and thus plays a larger role in diluting and dispersing contaminated groundwater in the overburden. Groundwater discharge to surface water from the overburden also leads to dilution and dispersion of contamination in Cowboy Creek (as evidenced by the very low concentration of TCE detected at SW-03). In deeper bedrock, dilution and dispersion is likely driven by upgradient clean groundwater which mixes with the bedrock groundwater plume.

Volatilization

TCE and breakdown constituents are VOCs, and therefore volatilization is expected to occur. The presence of VOCs in the sub-slab vapor samples from the residences shows that mass is being transferred from the dissolved phase to the vapor phase in the plume. This volatilization serves to reduce groundwater concentrations.

5.6.2.4 Summary of Natural Attenuation

- The historical dataset of residential wells appears to indicate a downward trend in concentrations prior to the 2012 excavation, potentially indicating natural attenuation and/or reduction in source zone mass discharge.

- Evidence indicates that both microbial reductive dehalogenation and aerobic cometabolic degradation of TCE are biodegradation mechanisms actively attenuating groundwater concentrations at the site.

- The principal zone of reactivity for destructive attenuation appears to be under and directly adjacent to the former dump areas. Significantly less microbial biomass is present downgradient, indicating less bioreactivity.

- Dilution and dispersion serves to actively reduce concentrations in transmissive bedrock fractures to the extent that transmissivity of individual fractures allow.
- VOC mass is volatilizing off the groundwater plume, serving to reduce groundwater concentrations (albeit with the result of increasing vapor concentrations).

5.6 Fate and Transport of Other SRCs

The other SRCs identified generally are not as widespread and mobile as the CVOCs described above. Although 1,4-dioxane was detected in most groundwater samples collected during the Round 2 and Round 3 sampling events, concentrations were much lower than observed for the primary SRCs (TCE and cis-1,2-DCE). However, many samples still exhibited exceedances of the RI screening criterion (0.4 µg/L) for 1,4-dioxane. Metals contamination was generally not identified above screening criteria in the groundwater monitoring wells (except for lead which slightly exceeded the screening criteria of 5 µg/L in two samples during Round 2), indicating that the metal SRCs generally remain tightly bound to soil particles, as generally would be expected for metals under typical environmental conditions with neutral pH. This situation will remain unchanged barring any significant changes to geochemistry in the soil (such as a significant decrease in pH). Such changes are highly unlikely given the current undeveloped state of the site. PCBs were only detected in soils in the former dump areas and adjacent residential area and not in any other site media. Similar to the metal SRCs, PCBs remain strongly sorbed to soil and are unlikely to migrate to other media. Since both metals and PCB soil contamination in soil are unlikely to act as sources for contamination in downgradient media and have not historically been observed as widespread as the CVOC SRCs, these contaminants are also considered secondary SRCs.

5.6.1 1,4-Dioxane

As described in Section 4, 1,4-dioxane contamination mirrors TCE contamination distribution below the former dump areas and residential area downgradient, but at much lower concentrations (up to 4.1 µg/L).

The dominant process affecting fate of 1,4-dioxane in soils is dissolution. Because of its high solubility, and low molecular weight, 1,4-dioxane is highly susceptible to rapidly dissolving into water infiltrating from the surface and leaching from soil into groundwater. 1,4-dioxane is completely miscible in groundwater. It has a low K_{oc} and therefore sorption to organic matter or clay will not retard its movement through the aquifer. The Henry's Law constant indicates that there is potential for it to partition from water to air (Agency for Toxic Substances and Disease Registry 2012).

1,4-dioxane was previously considered nonbiodegradable; however, the science evaluating degradation of 1,4-dioxane is evolving and a recent study concluded that it can degrade under aerobic conditions (Mahendra et al. 2013; Adamson et al. 2015).

Because of its complete miscibility in water and relatively low Henry's Law constant, 1,4-dioxane is unlikely to form a vapor plume in the vadose zone above a dissolved phase plume in groundwater.

5.6.2 Metals and PCBs

As described in Section 4, PCBs, lead, and chromium were identified in shallow soils in an area north of Dump Area A and downslope into the rear of a residential property on Brookwood Road. Note that the chromium found at the site is more likely to exist in non-toxic forms (e.g., trivalent chromium) rather than as hexavalent chromium, which is toxic and mobile.

Metals are in general retained strongly in soil at the relatively neutral pH conditions found in uncontaminated environments. In the absence of acidic conditions (observed occasionally at industrial sites where acids were discharged), negligible leaching of chromium or lead to groundwater is expected. These metals do not degrade, but rather can change oxidation state under various conditions which can affect bio-uptake.

Similarly, PCBs strongly sorb to soil and sediment. PCBs are nonpolar, stable organic compounds that are extremely resistant to biodegradation because of the chlorine "shell" protecting the carbon backbone. PCBs are minimally soluble in water and thus accumulate in groundwater only when the soil sources have elevated concentrations.

For both PCBs and these two metals, physical transport (e.g., erosion and entrainment of contaminated soil particles in surface runoff) is the primary transport mechanism. This transport mechanism explains the presence of these contaminants downslope from the dump areas, in the direction of surface water runoff.

5.7 Conceptual Site Model

The CSM is based on data collected during the RI and integrates information on geology, hydrogeology, source areas, and receptors. Figure 5-2 shows the CSM for the site.

5.7.1 Conceptual Site Model for PCBs and Metals

PCBs, lead, and chromium were detected in shallow soils in an area north of Dump Area A and downslope into the rear of a residential property on Brookwood Road. In general, metals are retained strongly in soil at the relatively neutral pH conditions found in uncontaminated environments. Similarly, PCBs strongly sorb to soil and sediment. For PCBs and these two metals, physical transport (e.g., erosion and entrainment of contaminated soil particles in surface runoff) is the primary transport mechanism. This transport mechanism explains the presence of these contaminants downslope from the dump areas, in the direction of surface water runoff.

5.7.2 Physical Setting with Respect to VOC Contaminant Migration

Site geology along the top and flanks of the ridge is characterized by a thin overburden (typically less than 10 ft thick) overlying gneiss and syenite bedrockformer dump areas. Residual source material (DNAPL) may also be present in the saturated zone. During rain events, discharge of contamination from the residual sources into groundwater occurs.

Contaminant Migration Pathways and Fate

The fate of a constituent in the environment is a function of its chemical properties, the physical nature of the site, and the microbial population present. The following bullets are key points regarding contaminant fate and migration at the site:

- When the waste material was present, contamination infiltrated the vadose zone under the dump areas dissolved in rainwater, but also potentially as DNAPL.
- Over time, dissolved contamination migrated along fractures both vertically and horizontally with the infiltrating rainwater. DNAPL migrated through fractures under the force of gravity. Contamination evidently reached groundwater and continues to reach groundwater.
- Because of the complex fracture network in bedrock and most of the features identified were hairline or discontinuous fractures, contamination may be present in discontinuous fractures in the DNAPL phase and may be sorbed to fine particles of glacial material that may have migrated downward over time and infilled fractures. Critically, many of these reservoirs of residual contamination may only be tangentially connected to transmissive fractures. So as rainwater continues to leach downward, the rainwater will pick up some, but not all, of the contamination stored in discontinuous dead-end fractures.
- The rate of mass transfer of the DNAPL that may be present in dead-end fractures into the infiltrating rainwater is limited by the rate of dissolution of the DNAPL. This net dissolution rate may be limited considering that the surface area of DNAPL in dead end fractures exposed to infiltrating rainwater, which flows in more transmissive fractures, is likely quite limited.
- DNAPL and contaminants in groundwater will typically transfer into the walls of fractures in porous bedrock (like sandstone) by diffusion (e.g., matrix diffusion). However, the matrix diffusion study conducted prior to the RI did not find evidence for widespread matrix diffusion. This is expected considering the hard, crystalline bedrock at the site has very low primary porosity (unlike sandstone).
- Volatilization of residual contamination is occurring in the vadose zone. This process is mass transfer limited if the residual contamination is in dead-end fractures.
- Once in groundwater, contamination migrates downgradient through advection in the secondary porosity of the bedrock, as evidenced by the detection of VOCs in downgradient monitoring wells.
- Mass is volatilizing off the groundwater over the plume. This process led to the decision to install vapor mitigation systems in structures over the plume.
- In groundwater, natural attenuation data indicate that the biodegradation mechanisms microbial reductive dehalogenation and aerobic cometabolic degradation are actively attenuating groundwater concentrations at the site. Additionally, concentrations reduce by dilution and dispersion.
- In the vadose zone, volatilization is an attenuation mechanism reducing contaminant mass that can serve as a source of groundwater contamination. However, this process is likely mass transfer limited if the contamination is in dead-end fractures.

5.7.3 Receptors

Human receptors at the site may be exposed to SRCs through ingestion of groundwater with TCE concentrations above drinking water standards and through soil vapors . The human health and ecological risk assessments provide a full discussion of potential exposure pathways and potentially impacted receptors.

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Section 6

Summary of Risk Assessments

This section presents summaries of the HHRA and SLERA completed as separate documents.

6.1 Human Health Risk Assessment

A baseline HHRA was performed for the Mansfield Trail Dump Site (CDM Smith 2019) to characterize potential human health risks associated with the site in the absence of any additional remedial action. The HHRA included evaluation of risks to potential receptors, including utility workers and trespassers in the former dump areas, recreational users of the bike trail, nearby residents, recreational users of Cowboy Creek, and future construction workers in the former dump area if the site is redeveloped.

Exposure pathways evaluated for soil in the HHRA include ingestion of and dermal contact with soil by utility workers, trespassers, bike trail recreational users, residents, and construction workers. In addition, inhalation of contaminants from soil was evaluated for trespassers in the former dump area using off-road vehicles who could be exposed to airborne particulates and for future construction workers in the former dump area who could be exposed to vapor emissions from surface and subsurface soil. Exposure pathways evaluated for groundwater include ingestion of and dermal contact with groundwater and inhalation of vapor released during showering and bathing by residents. Exposure pathways evaluated for surface water and sediment include ingestion of and dermal contact with Cowboy Creek by recreational users. The exposure pathway evaluated for potential vapor intrusion into buildings is inhalation by residents.

Potential cancer effects were evaluated by calculating probabilities that an individual will develop cancer over a lifetime exposure based on projected intakes and chemical-specific dose-response information. To characterize potential noncancer health effects, comparisons were made between estimated intakes of substances and toxicity thresholds. In general, EPA recommends an acceptable cancer risk range of 1×10^{-6} to 1×10^{-4} and noncancer health hazard index (HI) of unity as threshold values for potential human health impacts (EPA 1989). These values aid in determining whether additional remedial action is necessary at the site.

Elevated potential risks/hazards were identified for current/future residents assumed to use untreated impacted groundwater from the core of the plume at the site and assumed to contact surface soil in yards. Potential risks/hazards associated with soil in the former dump areas and bike trail area and with sediment and surface water in Cowboy Creek were not elevated.

Cancer risks for current/future residents (2×10^{-2} [1 in 100]) exceeded EPA's acceptable range of 1×10^{-6} to 1×10^{-4}, mainly from chromium, vinyl chloride, and TCE in groundwater and from chromium in soil. The cancer risk may have been overestimated because it was assumed that all the chromium is in the more toxic hexavalent form and included a maximum detected concentration in groundwater that was anomalously higher than other detected concentrations. It is likely that chromium at the site is primarily in the trivalent form based on earlier composite waste sample analysis from the former dump area (Weston 2010) that did not detect hexavalent chromium. However, even if chromium were assumed to be present in its trivalent form or the outlier removed, the total risk from other carcinogens (4×10^{-3} [1 in 1,000]) still exceeded EPA's acceptable cancer risk range, primarily due to vinyl chloride and TCE.

For noncancer hazards, the total HIs for current/future residents were above EPA's threshold of unity at the site (111 for both adults and children). The estimated noncancer hazards were driven primarily by potential exposure to TCE and chromium in groundwater and to a lesser extent by nickel, cobalt, and cis-1,2-DCE in groundwater. When outlier concentrations of chromium and nickel in groundwater were excluded from the calculations, total HIs still exceeded EPA's threshold of unity, mainly due to TCE in groundwater and to a lesser extent cobalt and cis-1,2-DCE in groundwater.

Health risks from lead in residential surface soil and groundwater were evaluated separately from other contaminants using a model that estimates the blood lead concentration. Based on the results of the model, lead in the Residential Area poses an elevated risk because more than 41 percent of children (ages 12 to 72 months) incidentally ingesting soil and consuming groundwater as tap water could have blood lead concentrations that exceed the blood lead level reference value of 5 micrograms per deciliter.

Residents may be exposed to volatile chemicals of potential concern (COPCs) via inhalation of vapor emanating from groundwater into enclosed structures via vapor intrusion. This exposure pathway is currently incomplete because mitigation systems are in place for residences that were affected by vapor intrusion, but the pathway was evaluated to determine the potential for risk in the absence of mitigation. Based on vapor intrusion screening, TCE and chloroform are present in the vadose zone below houses and in indoor air at concentrations that are elevated relative to human health screening levels. Therefore, vapor intrusion may also be a source of risk to receptors at the site if mitigation systems are removed or not maintained or if the shallow groundwater plume migrates below houses that do not have mitigation systems.

6.2 Screening Level Ecological Risk Assessment

A SLERA was performed for the Mansfield Trail Dump Site (CDM Smith 2018). A SLERA is a conservative approach to estimate potential ecological risk. The SLERA included evaluation of soil, sediment, and surface water samples from the site and its immediate surroundings using a comparison of contaminant concentrations in soil, sediment, and surface water to ecological screening criteria. The SLERA included the performance of food chain exposure modeling using conservative input parameters (e.g., maximum contaminant concentrations and highest ingestion rates with lowest body weights, assuming receptors spend all their time on the site).

Assessment endpoints (AEs) are explicit expressions of an environmental resource that is considered to be of value. The AEs take the form of a question, such as "Are site-related contaminant concentrations sufficient to adversely impact survival, growth, or reproduction of a receptor species?". The AE questions are answered through the use of measurement endpoints, such as the comparison of soil contaminant concentrations to ecological screening criteria or the use of food chain exposure modeling to estimate an average daily dose that can be compared to published toxicity reference values.

Twelve AEs were used in the Mansfield SLERA: 2 AEs used direct exposure, and 10 used food chain exposure modeling. The food chain exposure models were performed for 10 surrogate receptor species representing different feeding guilds (e.g., piscivores, carnivores, and herbivores) for birds and mammals. The results of the SLERA were as follows:

- **AE 1 – terrestrial receptors (soil invertebrates and plants):** For soil in the site and residential areas, 8 SVOCs, 7 pesticides, 2 PCBs, and 16 inorganics exceed both ecological screening levels (ESLs) and background concentrations. Soil poses risk to terrestrial receptors.
- **AE 2 – aquatic receptors (invertebrates, fish, and plants):** For surface water, aluminum, chromium, and zinc pose potential risk to aquatic receptors but only at one (zinc) or two (chromium) locations. Total cadmium and total lead each exceeded ESLs at a single location, but dissolved concentrations did not. Therefore, it was determined that these exceedances were likely due to sediment-associated contaminants and therefore does not pose risk to aquatic receptors. For sediment, 18 SVOCs, 3 pesticides, and 10 metals pose risk to aquatic receptors. Seep water poses no risk to aquatic receptors.
- **AE 3 – Piscivorous birds (great blue heron):** Five inorganics in sediment pose a risk to piscivorous birds.
- **AE 4 – Aquatic-feeding invertivorous birds (spotted sandpiper):** Sediment poses risk to invertivorous birds from exposure to 10 inorganics, 9 SVOCs, 4,4'-DDT and 4,4'-DDE.
- **AE 5 – Herbivorous birds (northern bobwhite):** Soil poses risk to herbivorous birds from exposure to five inorganics and one pesticide.
- **AE 6 – Terrestrial-feeding invertivorous birds (American robin):** Overall, site soil poses risk to invertivorous birds from exposure to 15 inorganics, 5 SVOCs, 1 pesticide, and 2 PCBs.
- **AE 7 – Carnivorous birds (red-tailed hawk):** Overall, site soil poses risk to carnivorous birds from exposure to 10 inorganics, 1 pesticide, and 2 PCBs.
- **AE 8 – Herbivorous mammals (eastern cottontail):** Overall, site soil poses potential risk to herbivorous mammals from exposure to 10 inorganics and 2 PCBs.
- **AE 9 – Omnivorous mammals (raccoon):** Overall, site sediment poses risk to omnivorous mammals from exposure to three inorganics.
- **AE 10 – Invertivorous mammals (short-tailed shrew):** Overall, site soil poses risk to invertivorous mammals from exposure to 15 inorganics, 1 SVOC, 1 pesticide, and 2 PCBs.
- **AE 11 – Carnivorous mammals (red fox):** Overall, site soil poses risk to carnivorous mammals from exposure to 12 inorganics, 3 SVOCs, and 2 PCBs.
- **AE 12 – Piscivorous mammals (mink):** Overall, sediment poses risk to piscivorous mammals from exposure to five inorganics and one SVOC.

In conclusion, the SLERA determined that site-related chemicals of potential ecological concern (COPECs) in sediment and soil may pose a risk to ecological receptors using the site. Risk was driven by metals (cadmium, copper, lead, selenium, and zinc), mercury, pesticides (4,4'-DDT and dieldrin), and PCBs (Aroclor 1254 and 1260) as these contaminants consistently were identified as COPECs across multiple receptor species.

The overall conclusion of the SLERA was that contaminants at the site pose risk to ecological receptors and that additional ecological evaluation, in the form of a Step 3a Ecological Risk Assessment, was warranted.

6.3 Step 3a Ecological Risk Assessment

The SLERA is a conservative approach to estimate potential risk. Maximum COPEC concentrations are compared to conservative screening values, thereby estimating the maximum potential for risk to terrestrial and aquatic receptors. In the food chain exposure models, assumptions are used such that potential risk from COPEC exposure is maximized. This is done by using maximum ingestion rates, lowest body weights, and maximum detected concentrations in matrices and food items, which maximizes the estimated dietary doses. The Step 3a approach is less conservative, and more realistic, by using average body weights; average food, soil/sediment, and water ingestion rates; refined site foraging factors; and the 95% upper confidence level (UCL) values as exposure point concentrations (EPCs). The problem formulation and exposure assessment in the Step 3a procedure are identical to those outlined in the SLERA. The effects assessment is refined by considering the background concentrations, nutrient and dietary considerations, frequency of detection, magnitude, pattern of COPEC detection, mode of toxicity and potential for bioaccumulation, multiple contaminant effects, and exposure considerations. The magnitude of COPEC contamination was assessed using the refined EPCs (i.e., 95% UCL). The modes of toxicity considered included direct contact exposure and ingestion through the refined food chain models, which can directly impact individual and population parameters such as survival, growth, and reproduction. Bioaccumulative contaminants were assessed in food chain models, regardless of potential risk through direct contact. Bioaccumulative contaminants include arsenic, cadmium, chromium, copper, nickel, lead, zinc, and PCBs. Multiple contaminant effects in sediment were assessed using the equilibrium partitioning sediment benchmark (ESB) methodology.

The ESB represents concentrations of SVOC mixtures in varying sediment types that are protective of benthic organisms (EPA 2012). Organic contaminants can partition between the organic carbon fraction of sediment and the interstitial water in a relatively constant ratio, and SVOCs may exert an additive effect on benthic organisms. The ESB approach determines the potential for risk by accounting for mixtures of SVOCs of different concentrations across sediment types. Sediment concentrations of individual SVOCs normalized for the sediment total organic carbon content (C_{OC}) are divided by refined screening values (C_{OC}, final chronic value) and then summed. If the value exceeds 1, there is potential risk to benthic organisms based on the SVOC mixture in sediment.

$$\Sigma ESBU = \Sigma \frac{Coc}{Coc, FCV}$$

CDM Smith

For this Step 3a analysis, the ESB was calculated for sediment sampling location SED11, which was the only sediment sample with SVOC concentrations exceeding background 95% UCLs. The SVOC concentrations were normalized for the sediment organic carbon content at SED11 (11.3 percent). The ESB was also calculated for the background sediment sample with the highest SVOC concentrations in location BSED10 for comparison. SVOC concentrations in BSED10 were normalized for the sediment organic carbon content of 10.51 percent. The summed ESB at SED11 was 5.1 compared to 1.5 in BSED10. Both exceeded 1, indicating potential risk to benthic organisms, and site sediments were nearly four times greater than background sediments. SVOC sediment concentrations were greatest at SED11 and were approximately one order of magnitude greater than SED10, the next downstream sample. However, because sediment SVOCs are likely due to leaching from old rail ties and there are no commensurate soil SVOC concentrations, it is unlikely that sediment SVOCs are site-related.

The same 12 AEs developed for the SLERA were used in the Mansfield Step 3a Ecological Risk Assessment: 2 AEs used direct exposure and 10 used food chain exposure modeling. The food chain exposure models were performed for the same 10 surrogate receptor species representing different feeding guilds (e.g., piscivores, carnivores, and herbivores) for birds and mammals. The results of the Step 3a are as follows:

- **AE 1 – Terrestrial receptors (soil invertebrates and plants):** For soil in the site and residential areas, exceedances of both background and ESLs occurred around all of the former dump sites and in the adjacent residential soils, and exceedances of lead and mercury were the most colocated, primarily because every soil sample exceeded the lead ESL. The other inorganic COPECs included antimony, cadmium, chromium, copper, manganese, nickel, and silver. PCBs also had high refined HQs, with Aroclor 1254 and Aroclor 1260 having HQs of 1,185 and 847, respectively, indicating that risk to soil invertebrates and plants is also driven by PCBs. Both PCB compounds had exceedances above ESLs throughout site and residential soils, indicative of sitewide contamination. Further, Aroclor 1254 exceeded the background 95% UCL in 25 samples, and the background HQ was 410. Aroclor 1260 was not detected in any of the background samples. Five pesticides were retained as COPECs: 4,4'-DDT, dieldrin, gamma-BHC (lindane), heptachlor, and methoxychlor. However, gamma-BHC (lindane) and heptachlor were each only detected in one sample. Only two SVOCs were retained as COPECs after refining EPCs: butylbenzylphthalate (HQ=5.7) and naphthalene (HQ=2.1); however, butylbenzylphthalate was only detected at a single sample location (SB12, adjacent to former Dump Area E), which also had exceedances for lead, mercury, and Aroclor 1260. Naphthalene only exceeded the ESL in one sample (SB13, within former Dump Area E). Lead and mercury were also detected above ESLs at SB13. There do not appear to be hot spots for COPECs; rather, contamination is widespread among the site and adjacent residential soils. Additionally, primary soil risk drivers exceeded their respective background 95% UCLs, suggesting that despite background concentrations exceeding ESLs for some COPECs, site concentrations are substantially higher and pose site-related risk to soil receptors (soil invertebrate and plants).
- **AE 2 – Aquatic receptors (invertebrates, fish, and plants):** For surface water, aluminum (total), cadmium (total), and lead (total and dissolved) were the only COPECs that had

refined HQs greater than 1. All other surface water COPECs identified in the SLERA had refined HQs less than 1. Surface water poses a risk to fish.

Risk in sediment based on refined EPCs was driven primarily by SVOCs in a single sample (SED11). The ESB analysis showed that the additive effect of all SVOCs in the sample exceeded the risk from background SVOC concentrations. However, the SVOCs were considered to have been from the former railroad bed that runs adjacent to the creek, thus, not related to former site activities. The inorganic COPECs were arsenic, lead, and nickel. The pesticides 4,4'-DDE, 4,4'-DDT, and gamma-chlordane all had HQs greater than 1 but were each only detected at SED11, the same location with the highest detected SVOC concentrations. Site sediment poses risk to benthic invertebrates.

- **AE 3 – Piscivorous birds (great blue heron):** No modeled risk to piscivorous birds.
- **AE 4 – Aquatic-feeding invertivorous birds (spotted sandpiper):** The no observed adverse effects level (NOAEL)-based HQs for DDE (8), and DDT (6) indicated potential risk, but the lowest observed adverse effect level (LOAEL)-based HQs were less than 1. The NOAEL-based HQ for zinc (23) and the LOAEL-based HQ (2.5) indicate risk. Several SVOCs were also found to have HQs greater than 1, but SVOCs were not considered site-related.
- **AE 5 – Herbivorous birds (northern bobwhite):** No modeled risk to herbivorous birds.
- **AE 6 – Terrestrial-feeding invertivorous birds (American robin):** NOAEL HQs for antimony (5.6), lead (12), silver (3), and 4,4'-DDT (6.4) were greater than 1, indicating potential risk. None of the LOAEL HQs were greater than 1.
- **AE 7 – Carnivorous birds (red-tailed hawk):** No modeled risk to carnivorous birds.
- **AE 8 – Herbivorous mammals (eastern cottontail):** No modeled risk to herbivorous mammals.
- **AE 9 – Omnivorous mammals (raccoon):** No modeled risk to omnivorous mammals.
- **AE 10 – Invertivorous mammals (short-tailed shrew):** NOAEL HQs for antimony (5), chromium (2), copper (3.6), lead (2), and silver (2) were greater than 1, indicating potential risk. None of the LOAEL HQs were greater than 1.
- **AE 11 – Carnivorous mammals (red fox):** No modeled risk to carnivorous mammals.
- **AE 12 – Piscivorous mammals (mink):** No modeled risk to piscivorous mammals.

Zinc in sediment was identified as a potential risk to the spotted sandpiper. However, based upon a comparison of the range of site sediment zinc concentrations to background sediment zinc concentrations, it is unclear whether zinc sediment concentrations are site-related. Further, the calculated preliminary remediation goal was less than site background concentrations.

Section 7

Conclusions and Recommendations

Data from field investigations were evaluated to define the nature and extent of contamination in groundwater, soil, surface water, sediment, and vapor at the site. The nature and extent of contamination in site media was used in conjunction with the evaluation of site-specific geology and hydrogeology to develop the CSM. These activities met the RI objectives. The conclusions and recommendations of the RI are presented below.

7.1 Conclusions

This section provides the key conclusions based on evaluation of the RI data.

7.1.1 Sources

- The waste disposed in the dump areas is the original source of VOC contamination at the site. Waste disposal (dumping) activities began between 1956 and 1959 and ended between 1973 and 1974. Waste disposed in Dump Areas A and D was mostly like septic waste. Dump Areas B, C, and E (approximately 75,000 ft^2) were covered with potentially contaminated fill materials.

- The waste materials in the source areas were excavated down to the top of bedrock in 2012. Sampling prior to excavation detected TCE concentrations indicative of DNAPL (greater than the 1 percent solubility threshold of 14.7 mg/kg) in overburden soils primarily in Dump Areas A and D. Post excavation sampling found little evidence of remnant CVOC contamination in the overburden within or near the former dump areas.

- Site geology along the top and flanks of the ridge where the former waste disposal areas are located is characterized by a thin overburden, typically less than 10 ft thick, overlying gneiss and syenite bedrock. This bedrock is a hard, crystalline bedrock with low primary porosity and low potential for matrix diffusion. Prior to their removal in 2012, VOCs in waste materials migrated through the shallow overburden material at the top of the ridge and into the fractured bedrock system.

7.1.2 Contaminant Transport in Groundwater

- The depth to water can fluctuate significantly because of rainfall and the low storativity in the bedrock aquifer. Depth to water is greatest on the ridge (60 to 80 ft bgs) and decreases moving downslope toward Cowboy Creek.

- The shallower bedrock is more weathered, consisting of a greater density of hairline fractures, discontinuous fractures, and rubble zones. Many of the fractures are likely dead-end and not the type that are flushed regularly by infiltrating groundwater. Contaminants that entered the bedrock from the waste disposal are potentially stored in the dead-end fractures or within rubble zones (as encountered in rock core CB-3). Sorbed contaminant mass present in these infilled fractures and rubble zones acts as a continuing source of contaminant mass. During rain events, precipitation transports contamination from the residual sources to the water table.

- Once in groundwater, contamination migrates downgradient through advection in the secondary porosity of the bedrock. Transmissive fractures are abundant in the bedrock, with potential transmissivity at almost all intervals of boreholes. Groundwater migrates from the higher-elevation former dump areas to the north-northwest, discharging to surficial seeps and the overburden groundwater in the lower areas or flowing deeper into the bedrock system.

- The extent of overburden groundwater contamination appears limited, extending to and discharging to Cowboy Creek or the nearby wetlands. The contamination in the deeper bedrock groundwater extends laterally in the fractured rock aquifer as far as MLS-11 and MLS-13 and vertically to depths up to approximately 400 ft bgs in MLS-11.

7.1.3 Contaminant Fate

- In the deeper bedrock, dilution and dispersion are the main mechanisms reducing concentrations quickly in the bedrock flow system northwest of Brookwood Road.

- Evaluation of natural attenuation data indicate that microbial reductive dehalogenation and aerobic cometabolic degradation are actively attenuating groundwater concentrations of TCE and its degradation products at the site.

- CVOC mass is volatilizing from the groundwater over the plume and migrating through soil resulting in CVOC vapor concentrations in soil gas and sub-slab air beneath homes along Brookwood Road to levels that have required vapor mitigation systems to be installed in structures over the plume. Contaminant mass is being removed through volatilization from groundwater.

- CVOC concentrations have generally decreased from 2014 to 2017 in bedrock immediately below source areas but have been detected at higher concentrations over a greater lateral and vertical distance from the source areas in bedrock.

7.1.4 Soil, Surface Water, and Sediment

- CVOCs were not found in downgradient soils or sediment but were found at low concentrations in Cowboy Creek due to groundwater discharge into the surface water bodies.

- PCBs, lead, and chromium were identified in shallow soils in an area north of Dump Area A and downslope into the rear of a residential property on Brookwood Road. In general, metals are sorbed to soils at neutral pH. Similarly, PCBs strongly sorb to soil and sediment. For PCBs, lead, and chromium, physical transport (e.g., erosion and entrainment of contaminated soil particles in surface runoff) is the primary transport mechanism. This transport mechanism explains the presence of these contaminants in localized areas downslope from the dump areas.

7.2 Recommendations

- In consultation with EPA, CDM Smith recommends that the Mansfield Trail Dump Site RI/FS continue with FS evaluations and development of remedial alternatives for the contaminated media.
- Additional investigations into the extent and location of remnant source in the vadose zone can be performed during the remedial design phase since the additional data are not expected to affect the FS remedial alternatives evaluations. This information will assist in better targeting in-situ treatment for any residual sources contributing mass to the groundwater plume. Results could be summarized in the pre-design investigation report.

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Section 8

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Tables

Table 2-1
Soil Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Location	Sample ID	Sample Date	Sample Depth (inches bgs)	Organics[1]	Inorganics[2]
SS-01	SS-01-A	7/18/2017	0 - 12	X	X
SS-02	SS-02-A	7/17/2017	0 - 4	X	X
	SS-902-A[3]	7/17/2017	0 - 4	X	X
SS-03	SS-03-A	7/17/2017	0 - 6	X	X
SS-04	SS-04-A	7/18/2017	0 - 12	X	X
SS-05	SS-05-A	7/17/2017	0 - 8	X	X
SS-06	SS-06-A	7/17/2017	0 - 12	X	X
SS-07	SS-07-A	7/17/2017	0 - 6	X	X
SS-08	SS-08-A	7/17/2017	0 - 10	X	X
SS-09	SS-09-A	7/18/2017	0 - 6	X	X
SS-10	SS-10-A	7/18/2017	0 - 6	X	X
SS-11	SS-11-A	7/18/2017	0 - 12	X	X
SS-12	SS-12-A	7/17/2017	0 - 10	X	X

Notes

1. VOCs, SVOCs, PCBs, pesticides
2. TAL metals, mercury
3. Duplicate of SS-02-A

Acronyms

bgs - below ground surface
ID - identification
PCBs - polychlorinated biphenyls
SVOCs - semivolatile organic compounds
TAL - Target Analyte List
VOCs - volatile organic compounds

Table 2-2
Surface Water and Sediment Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Location	Sample ID	Sample Date	Sampling Depth (ft bgs)	Matrix	TCL VOCs	Trace VOC + Trace VOC SIM
Residential Area Seep and Catch Basin Sampling						
SP-02	SP-02-1	7/17/2017	NA	SW		X
	SP-902-1[1]	7/17/2017	NA	SW		X
SP-03	SP-03-1	7/17/2017	NA	SW		X
SP-06	SP-06-1	7/17/2017	NA	SW		X
SP-07	SP-07-1	7/17/2017	NA	SW		X
SP-08	SP-08-1	7/17/2017	NA	SW		X
SP-09	SP-09-1	7/18/2017	NA	SW		X
SP-10	SP-10-1	7/18/2017	NA	SW		X
CB-01	CB-01	7/18/2017	NA	SW		X
CB-02	CB-02	7/18/2017	NA	SW		X
Cowboy Creek Piezometers						
PZ-01	SD-PZ-01-A	11/7/2017	0-0.5	SE	X	
	SW-PZ-01-1	11/7/2017	NA	SW		X
PZ-04	SD-PZ-04-A	11/7/2017	0-0.5	SE	X	
	SD-PZ-904-A[2]	11/7/2017	0-0.5	SE	X	
	SW-PZ-04-1	11/7/2017	NA	SW		X
	SW-PZ-904-1[3]	11/7/2017	NA	SW		X

Notes:

1. Duplicate of SP-02-1
2. Duplicate of SD-PZ-04-A
3. Duplicate of SW-PZ-04-1

Acronyms:

bgs - below ground surface
CB - catach basin
ft - feet
ID - identification
NA - not applicable
PZ - piezometer
SE - sediment
SIM - selective ion monitoring
SP - seep
SW - surface water
TCL - target compound list
VOC - volatile organic compounds

Table 2-3
Packer Testing Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Sample ID	Top of Interval (feet bgs)	Bottom of Interval (feet bgs)	Estimated Transmisivity ($feet^2$/ day)	Trace VOCs + Trace VOCs SIM	Sample Date
MLS-13	MLS-13-Z1	37	60	0.949	X	7/24/2017
	MLS-13-Z2	65	80	17.6	X	7/21/2017
	MLS-13-Z3	85	100	56.9	X	7/21/2017
	MLS-13-Z4	125	140	0.11	X	7/21/2017
	MLS-13-Z5	145	160	0.030	X	7/20/2017
	MLS-13-Z6	170	185	269.4	X	7/20/2017
	MLS-13-Z7	240	255	0.36	X	7/24/2017
MLS-14	MLS-14-Z1	55	70	60.4	X	7/19/2017
	MLS-14-Z2	70	85	1.45	X	7/19/2017
	MLS-14-Z3	97	112	16.6	X	7/17/2017
	MLS-901-ZD[1]	97	112	16.6	X	7/17/2017
	MLS-14-Z4	131	146	0.266	X	7/19/2017
	MLS-14-Z5	146	161	45.3	X	7/18/2017
	MLS-14-Z6	170	185	63.8	X	7/18/2017
	MLS-14-Z7	201	216	0.553	X	7/18/2017
MW-15B	MW-15B-Z2	40	50	NA	X	10/4/2017
	MW-15B-Z3	50	60	NA	X	10/4/2017
	MW-15B-Z4	85	100	NA	X	10/3/2017
	MW-902[2]	85	100	NA	X	10/3/2017
MW-16	MW-16-Z1	33	38	12.2	X	7/13/2017
	MW-900-ZD[3]	33	38	12.2	X	7/13/2017
	MW-16-Z2	38	53	130.4	X	7/13/2017
	MW-16-Z3	56	71	1.23	X	7/14/2017
	MW-16-Z4	76	91	0.495	X	7/13/2017
	MW-16-Z5	130	145	0.120	X	7/12/2017
	MW-16-Z6	170	197	60.2	X	7/12/2017

Notes:
1. Duplicate of MLS-14-Z3
2. Duplicate of MW-15B-Z4
3. Duplicate of MW-16-Z1

Acronyms:
bgs - below ground surface
ID - identification
NA - no analysis
SIM - selective ion monitoring
VOC - volatile organic compound

Table 2-4
Piezometer and Monitoring Well Construction Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Surface Elevation (ft NAVD)	Total Depth (ft bgs)	Casing Type	Port	Top of Casing Elevation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)	Pump Intake (ft bgs)	Well Screen Intervals (ft)	
Multiport Wells											Top	Bottom
MLS-1	437164.16	762905.78	914.98	401	SSU	1	917.9	884.98	869.98	--	30	45
						2	917.96	834.98	819.98	--	80	95
						3	917.87	807.98	792.98	--	107	122
						4	917.88	685.98	670.98	--	229	244
						5	917.92	629.98	614.98	--	285	300
						6	917.87	572.98	557.98	--	342	357
MLS-2	437476.27	763639.02	914.88	400	SSU	1	916.78	879.88	864.88	--	35	50
						2	916.77	859.88	844.88	--	55	70
						3	916.80	814.88	799.88	--	100	115
						4	916.8	795.88	780.88	--	119	134
						5	916.78	749.88	734.88	--	165	180
						6	916.79	574.88	559.88	--	340	355
MLS-3	436963.46	763336.09	955.77	400	SSU	1	950.26	890.77	875.77	--	65	80
						2	950.24	845.77	830.77	--	110	125
						3	950.24	781.77	766.77	--	174	189
						4	950.28	740.77	725.77	--	215	230
						5	950.30	715.77	700.77	--	240	255
						6	950.33	660.77	645.77	--	295	310
						7	950.34	630.77	615.77	--	325	340
MLS-4	436980.65	763237.42	956.46	500	SSU	1	957.78	883.46	868.46	--	73	88
						2	957.76	846.46	831.46	--	110	125
						3	957.74	756.46	741.46	--	200	215
						4	957.74	646.46	631.46	--	310	325
						5	957.73	595.46	580.46	--	361	376
						6	957.73	496.46	481.46	--	460	475
MLS-5	437480.01	763382.70	917.86	400	SSU	1	919.70	883.86	868.86	--	34	49
						2	919.69	842.86	827.86	--	75	90
						3	919.69	815.86	800.86	--	102	117
						4	919.72	723.86	708.86	--	194	209
						5	919.71	604.86	589.86	--	313	328
MLS-6	437452.50	763138.59	918.95	337	SSU	1	921.45	888.95	873.95	--	30	45
						2	921.44	868.95	853.95	--	50	65
						3	921.46	808.95	793.95	--	110	125
						4	921.45	758.95	743.95	--	160	175
						5	921.48	718.95	703.95	--	200	215
						6	921.5	683.95	668.95	--	235	250
						7	921.49	597.95	582.95	--	321	336
MLS-7	437575.54	763742.85	901.73	400	SSU	1	903.25	866.73	851.73	--	35	50
						2	903.25	834.73	819.73	--	67	82
						3	903.28	782.73	767.73	--	119	134
						4	903.26	631.73	616.73	--	270	285
						5	903.26	525.73	510.73	--	376	391

Table 2-4
Piezometer and Monitoring Well Construction Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Surface Elevation (ft NAVD)	Total Depth (ft bgs)	Casing Type	Port	Top of Casing Elevation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)	Pump Intake (ft bgs)	Well Screen Intervals (ft)	
MLS-8	436264.65	763065.94	850.25	300	SRB	1	849.19	795.25	780.25	--	55	70
						2	849.13	780.25	765.25	--	70	85
						3	849.13	742.25	727.25	--	108	123
						4	849.10	645.25	630.25	--	205	220
						5	849.13	615.25	600.25	--	235	250
						6	849.17	569.25	554.25	--	281	296
MLS-9	436694.03	763779.18	789.74	300	SRB	1	788.40	735.74	720.74	--	54	69
						2	788.39	707.74	692.74	--	82	97
						3	788.38	689.74	674.74	--	100	115
						4	788.39	664.74	649.74	--	125	140
						5	788.43	614.74	599.74	--	175	190
						6	788.43	518.74	503.74	--	271	286
MLS-11	435781.40	764004.80	710.90	400	SRB	1	709.93	651.90	636.90	--	59	74
						2	709.95	610.90	595.90	--	100	115
						3	709.95	591.90	576.90	--	175	190
						4	709.95	545.90	530.90	--	200	215
						5	709.90	433.90	418.90	--	277	292
						6	709.95	358.90	343.90	--	367	382
MLS-13*	437439.90	764193.20	813.81	300	SSU	1	813.40	773.81	758.81	--	40	55
						2	813.40	748.81	733.81	--	65	80
						3	813.40	728.81	713.81	--	85	100
						4	813.35	643.81	628.81	--	170	185
						5	813.35	573.81	543.81	--	240	255
MLS-14*	435731.00	765111.10	712.56	300	SSU	1	715.78	657.56	642.56	--	55	70
						2	715.78	615.56	600.56	--	97	112
						3	715.78	566.56	551.56	--	146	161
						4	715.78	542.56	527.56	--	170	185
Monitoring Wells												
MW-1	437409.45	763197.17	922.7	100	SRB	--	919.13	888.71	824.21	--	34	100
MW-2	437391.80	763302.20	922.7	100	SRB	--	923.13	902.71	822.21	--	20	100
MW-3	437308.50	762089.60	922.6	100	SRB	--	923.00	--	822.61	--	-	-
MW-4	437331.67	762983.78	917.44	20	PSU	--	920.81	907.44	897.44	--	10	20
MW-5	437153.60	762892.41	914.4	10	PSU	--	918.22	909.41	904.41	--	5	10
MW-6	437270.18	762877.45	916.75	20	PSU	--	920.13	906.75	896.75	--	10	20
MW-7	436230.06	765248.46	709.89	13	PRB	--	710.32	706.89	696.89	--	3	13
MW-8	435390.58	764842.67	710.73	15	PRB	--	711.27	706.73	696.73	--	4	14
MW-9	436202.29	763498.81	773.42	50	PRB	--	773.75	733.42	723.42	--	40	50
MW-10	437028.44	763995.46	797.89	23	PRB	--	798.28	784.89	774.89	--	13	23
MW-11	435782.28	764012.79	710.55	39	PRB	--	710.98	682.05	672.05	--	28.5	38.5
MW-12	437619.54	764645.11	772.39	15	PSU	--	775.86	767.59	757.59	--	4.8	14.8
MW-13	436986.18	764347.14	750.66	18.5	PSU	--	753.49	742.16	732.16	--	8.5	18.5
MW-14	435968.89	764038.96	709.40	14	PSU	--	712.2	705.40	695.40	--	4	14
MW-15B*	437583.20	763178.20	877.50	101	PSU	--	879.0	792.50	777.50	--	85	100

Table 2-4
Piezometer and Monitoring Well Construction Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Surface Elevation (ft NAVD)	Total Depth (ft bgs)	Casing Type	Port	Top of Casing Elevation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)	Pump Intake (ft bgs)	Well Screen Intervals (ft)	
MW-16*	437412.70	762462.10	919.79	200	SSU	--	922.6	734.79	719.79	--	185	200
Piezometers												
PZ-1	436481.68	764798.44	708.73	2.35	SSU	--	710.60	707.81	706.81	--	0.35	2.35
PZ-2	436116.82	764788.76	707.42	2.20	SSU	--	709.6	706.81	704.81	--	0.2	2.2
PZ-3	435804.22	764795.68	706.44	2.40	SSU	--	708.39	706.09	704.09	--	0.4	2.4
PZ-4*	437281.70	765127.60	724.22	3.14	SSU	--	725.03	724.02	722.02	--	1.14	3.14
OPZ-1*	436516.60	764774.20	710.95	1.92	PSU	--	715.22	710.55	708.55	--	0.92	1.92
OPZ-4*	437279.00	765116.00	725.15	2.61	PSU	--	729.49	724.01	722.01	--	1.14	3.14
Residential Wells**												
BYR-DW113	436477.97	763368.72	832.00	200	--	--	--	--	--	--	-	-
BYR-DW115	436494.02	763160.20	890.00	200	--	--	--	--	--	--	-	-
BYR-DW159	435802.35	763211.71	794.00	100	--	--	--	--	--	--	-	-
BYR-DW117	436222.15	763403.89	790.11	100	--	--	--	--	--	80	-	-
BYR-DW118	436489.02	763506.10	807.19	150	--	--	--	--	--	100	-	-
BYR-DW119	436190.38	763655.46	764.00	150	--	--	--	--	--	--	-	-
BYR-DW120	436674.21	763613.85	815.68	285	--	--	--	--	--	260	-	-
BYR-DW126	436799.51	763704.26	870.00	285	--	--	--	--	--	--	-	-
BYR-DW124	436521.16	763809.72	772.00	290	--	--	--	--	--	--	-	-
BYR-DW125	436978.31	763841.54	818.60	298	--	--	--	--	--	--	-	-
BYR-DW122	436643.10	763881.84	778.05	125	--	--	--	--	--	45	-	-
BYR-DW127	436831.41	763993.75	782.77	150	--	--	--	--	--	100	-	-
BYR-DW128	437383.76	764029.34	881.12	300	--	--	--	--	--	--	-	-
BYR-DW129	436967.53	764091.62	785.37	150	--	--	--	--	--	120	-	-
BYR-DW170	435314.14	763807.77	792.00	150	--	--	--	--	--	--	-	-
BYR-DW131	437432.97	764348.74	802.05	150	--	--	--	--	--	120	-	-

Notes:

* - Wells or piezometers installed in 2017

** - Elevation is estimated for all residential wells

Acronyms:

bgs - below ground surface
ft - feet
ID - identification
MSL - feet above mean sea level
NAVD - North American Vertical Datum of 1988

PSU - PVC stick-up
PRB - PVC flush-mount (roadbox)
SRB - steel flush-mount (roadbox)
SSU - steel stick up

Table 2-5
Piezometer and Monitoring Well Survey Information
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Eelvation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)
Multiport Wells					
MLS-1-1	437164.16	762905.78	914.98	884.98	869.98
MLS-1-2				834.98	819.98
MLS-1-3				807.98	792.98
MLS-1-4				685.98	670.98
MLS-1-5				629.98	614.98
MLS-1-6				572.98	557.98
MLS-2-1	437476.27	763639.02	914.88	879.88	864.88
MLS-2-2				859.88	844.88
MLS-2-3				814.88	799.88
MLS-2-4				795.88	780.88
MLS-2-5				749.88	734.88
MLS-2-6				574.88	559.88
MLS-3-1	436963.46	763336.09	955.77	890.77	875.77
MLS-3-2				845.77	830.77
MLS-3-3				781.77	766.77
MLS-3-4				740.77	725.77
MLS-3-5				715.77	700.77
MLS-3-6				660.77	645.77
MLS-3-7				630.77	615.77
MLS-4-1	436980.65	763237.42	956.46	883.46	868.46
MLS-4-2				846.46	831.46
MLS-4-3				756.46	741.46
MLS-4-4				646.46	631.46
MLS-4-5				595.46	580.46
MLS-4-6				496.46	481.46
MLS-5-1	437480.01	763382.7	917.86	883.86	868.86
MLS-5-2				842.86	827.86
MLS-5-3				815.86	800.86
MLS-5-4				723.86	708.86
MLS-5-5				604.86	589.86
MLS-6-1	437452.50	763138.59	918.95	888.95	873.95
MLS-6-2				868.95	853.95
MLS-6-3				808.95	793.95
MLS-6-4				758.95	743.95
MLS-6-5				718.95	703.95
MLS-6-6				683.95	668.95
MLS-6-7				597.95	582.95

Table 2-5
Piezometer and Monitoring Well Survey Information
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Eelvation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)
MLS-7-1	437575.54	763742.85	901.73	866.73	851.73
MLS-7-2				834.73	819.73
MLS-7-3				782.73	767.73
MLS-7-4				631.73	616.73
MLS-7-5				525.73	510.73
MLS-8-1	436264.65	763065.94	850.25	795.25	780.25
MLS-8-2				780.25	765.25
MLS-8-3				742.25	727.25
MLS-8-4				645.25	630.25
MLS-8-5				615.25	600.25
MLS-8-6				569.25	554.25
MLS-9-1	436694.03	763779.18	789.74	735.74	720.74
MLS-9-2				707.74	692.74
MLS-9-3				689.74	674.74
MLS-9-4				664.74	649.74
MLS-9-5				614.74	599.74
MLS-9-6				518.74	503.74
MLS-11-1	435781.4	764004.8	710.90	651.90	636.90
MLS-11-2				610.90	595.90
MLS-11-3				591.90	576.90
MLS-11-4				545.90	530.90
MLS-11-5				433.90	418.90
MLS-11-6				358.90	343.90
MLS-13-1	437439.90	764193.20	813.81	773.81	758.81
MLS-13-2				748.81	733.81
MLS-13-3				728.81	713.81
MLS-13-4				643.81	628.81
MLS-13-5				573.81	543.81
MLS-14-1	435731.00	765111.10	712.56	657.56	642.56
MLS-14-2				615.56	600.56
MLS-14-3				566.56	551.56
MLS-14-4				542.56	527.56
Monitoring Wells					
MW-1	437409.45	763197.17	922.7	888.71	824.21
MW-2	437391.80	763302.20	922.7	902.71	822.21
MW-3	437308.50	762089.60	922.6	--	822.61
MW-4	437331.67	762983.78	917.44	907.44	897.44
MW-5	437153.60	762892.41	914.4	909.41	904.41
MW-6	437270.18	762877.45	916.75	906.75	896.75
MW-7	436230.06	765248.46	709.89	706.89	696.89
MW-8	435390.58	764842.67	710.73	706.73	696.73
MW-9	436202.29	763498.81	773.42	733.42	723.42
MW-10	437028.44	763995.46	797.89	784.89	774.89

Table 2-5
Piezometer and Monitoring Well Survey Information
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Easting	Northing	Ground Eelvation (ft NAVD)	Top of Screen (ft NAVD)	Bottom of Screen (ft NAVD)
MW-11	435782.28	764012.79	710.55	682.05	672.05
MW-12	437619.54	764645.11	772.39	767.59	757.59
MW-13	436986.18	764347.14	750.66	742.16	732.16
MW-14	435968.89	764038.96	709.40	705.40	695.40
MW-15B	437583.20	763178.20	877.50	792.50	777.50
MW-16	437412.70	762462.10	919.79	734.79	719.79
Piezometers					
PZ-1	436481.68	764798.44	708.73	707.81	706.81
PZ-2	436116.82	764788.76	707.42	706.81	704.81
PZ-3	435804.22	764795.68	706.44	706.09	704.09
PZ-4	437281.70	765127.60	724.22	724.02	722.02
OPZ-1	436516.60	764774.20	710.95	710.55	708.55
OPZ-4	437279.00	765116.00	725.15	724.01	722.01

Acronyms:

bgs - below ground surface

ft - feet

ID - identification

NAVD - North American Vertical Datum of 1988

Table 2-6a
Round 2 Monitoring Well and Piezometer Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Location	Sample ID	Sample Date	Sampling Depth (ft bgs)	Organics[1]	MNA Parameters[2]	Metals	CSIA	Trace VOC + VOC SIM
Mulitport Wells								
MLS-1	MLS-1-1-R2	11/6/2017	30 - 45	X	X			
	MLS-1-2-R2	11/6/2017	80 - 95	X	X			
	MLS-1-3-R2	11/6/2017	107 - 122	X	X			
	MLS-1-4-R2	11/6/2017	229 - 244	X	X			
	MLS-1-5-R2	11/6/2017	285 - 300	X	X			
	MLS-1-6-R2	11/6/2017	342 - 357	X	X			
MLS-2	MLS-2-1-R2	11/14/2017	35 - 50	X	X			
	MLS-2-2-R2	11/14/2017	55 - 70	X	X			
	MLS-2-3-R2	11/14/2017	100 - 115	X	X			
	MLS-2-4-R2	11/14/2017	119 - 134	X	X			
	MLS-2-5-R2	11/14/2017	165 - 180	X	X			
	MLS-2-6-R2	11/14/2017	340 - 355	X	X			
MLS-3	MLS-3-1-R2	11/7/2017	65 - 80	X	X		X	
	MLS-3-2-R2	11/7/2017	110 - 125	X	X	X	X	
	MLS-3-3-R2	11/7/2017	174 - 189	X	X			
	MLS-3-4-R2	11/7/2017	215 - 230	X	X		X	
	MLS-3-5-R2	11/7/2017	240 - 255	X	X			
	MLS-3-5D-R2[3]	11/7/2017	240 - 255	X	X			
	MLS-3-6-R2	11/7/2017	295 - 310	X	X			
	MLS-3-7-R2	11/7/2017	325 - 340	X	X			
MLS-4	MLS-4-1-R2	11/8/2017	73 - 88	X	X		X	
	MLS-4-2-R2	11/8/2017	110 - 125	X	X		X	
	MLS-4-3-R2	11/8/2017	200 - 215	X	X		X	
	MLS-4-4-R2	11/8/2017	310 - 325	X	X			
	MLS-4-5-R2	11/8/2017	361 - 376	X	X		X	
	MLS-4-6-R2	11/8/2017	460 - 475	X	X			
MLS-5	MLS-5-1-R2	11/15/2017	34 - 49	X	X			
	MLS-5-2-R2	11/15/2017	75 - 90	X	X			
	MLS-5-3-R2	11/15/2017	102 - 117	X	X			
	MLS-5-4-R2	11/15/2017	194 - 209	X	X			
	MLS-5-5-R2	11/15/2017	313 - 328	X	X			
MLS-6	MLS-6-1-R2	11/15/2017	30 - 45	X	X			
	MLS-6-2-R2	11/14/2017	50 - 65	X	X			
	MLS-6-3-R2	11/15/2017	110 - 125	X	X		X	
	MLS-6-4-R2	11/15/2017	160 - 175	X	X			
	MLS-6-5-R2	11/15/2017	200 - 215	X	X			
	MLS-6-6-R2	11/15/2017	235 - 250	X	X			
	MLS-6-7-R2	11/15/2017	321 - 336	X	X			
MLS-7	MLS-7-1-R2	11/16/2017	35 - 50	X	X			
	MLS-7-1D-R2[4]	11/16/2017	35 - 50	X	X			
	MLS-7-2-R2	11/16/2017	67 - 82	X	X			
	MLS-7-3-R2	11/16/2017	119 - 134	X	X		X	
	MLS-7-4-R2	11/16/2017	270 - 285	X	X			
	MLS-7-5-R2	11/16/2017	376 - 391	X	X			
MLS-8	MLS-8-1-R2	11/22/2017	55 - 70	X	X			
	MLS-8-2-R2	11/22/2017	70 - 85	X	X			
	MLS-8-3-R2	11/22/2017	108 - 123	X	X			
	MLS-8-4-R2	11/22/2017	205 - 220	X	X			
	MLS-8-5-R2	11/22/2017	235 - 250	X	X			
	MLS-8-6-R2	11/22/2017	281 - 296	X	X			

Table 2-6a
Round 2 Monitoring Well and Piezometer Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Location	Sample ID	Sample Date	Sampling Depth (ft bgs)	Organics[1]	MNA Parameters[2]	Metals	CSIA	Trace VOC + VOC SIM
MLS-9	MLS-9-1-R2	11/21/2017	54 - 69	X	X			
	MLS-9-2-R2	11/21/2017	82 - 97	X	X			
	MLS-9-3-R2	11/21/2017	100 - 115	X	X			
	MLS-9-4-R2	11/21/2017	125 - 140	X	X			
	MLS-9-5-R2	11/21/2017	175 - 190	X	X	X		
	MLS-9-6-R2	11/21/2017	271 - 286	X	X			
MLS-11	MLS-11-1-R2	11/20/2017	59 - 74	X	X			
	MLS-11-2-R2	11/20/2017	100 - 115	X	X			
	MLS-11-3-R2	11/20/2017	119 - 134	X	X			
	MLS-11-4-R2	11/20/2017	165 - 180	X	X			
	MLS-11-5-R2	11/20/2017	277 - 292	X	X			
	MLS-11-6-R2	11/20/2017	352 - 367	X	X			
MLS-13	MLS-13-1-R2	11/21/2017	40 - 55	X	X			
	MLS-13-2-R2	11/21/2017	65 - 80	X	X			
	MLS-13-3-R2	11/21/2017	85 - 100	X	X	X	X	
	MLS-13-3D-R2[5]	11/21/2017	85 - 100	X	X	X	X	
	MLS-13-4-R2	11/21/2017	170 - 185	X	X			
	MLS-13-5-R2	11/21/2017	240 - 270	X	X			
MLS-14	MLS-14-1-R2	11/17/2017	55 - 70	X	X			
	MLS-14-2-R2	11/17/2017	97 - 112	X	X			
	MLS-14-3-R2	11/17/2017	146 - 161	X	X			
	MLS-14-4-R2	11/17/2017	170 - 185	X	X			
Monitoring Wells								
MW-3	MW-3-R2	11/1/2017	20 - 100	X	X			
MW-4	MW-4-R2	10/31/2017	10 - 20	X	X			
MW-5	MW-5-R2	10/31/2017	5 - 10	X	X			
MW-6	MW-6-R2	10/31/2017	10 - 20	X	X			
MW-7	MW-7-R2	11/3/2017	3 - 13	X	X			
MW-8	MW-8-R2	11/3/2017	4.8 - 14	X	X			
MW-9	MW-9-R2	11/3/2017	40 - 50	X	X		X	
MW-10	MW-10-R2	11/3/2017	13 - 50	X	X		X	
MW-11	MW-11-R2	11/2/2017	28.5 - 38.5	X	X			
MW-12	MW-12-R2	11/2/2017	4.8 - 14.8	X	X			
MW-13	MW-13-R2	11/2/2017	8.5 - 18.5	X	X		X	
MW-14	MW-14-R2	11/2/2017	4 - 14	X	X			
MW-15B	MW-15B-R2	11/1/2017	85 - 100	X	X			
MW-16	MW-16-R2	10/30/2017	185 - 200	X	X			
Piezometers								
OPZ-01	OPZ-01-R2	11/7/2017	0.92 - 1.92					X
OPZ-04	OPZ-04-R2	11/7/2017	0.61 - 2.61					X
PZ-01	PZ-01-R2	11/7/2017	0.35 - 2.35					X
PZ-02	PZ-02-R2	11/8/2017	0.2 - 2.2					X
PZ-03	PZ-03-R2	11/8/2017	0.4 - 2.4					X
PZ-04	PZ-04-R2	11/7/2017	1.14 - 3.14					X

Notes:
1. VOCs, SVOCs, and 1,4-Dioxane
2. Nitrate/Nitrite, Sulfate, Chloride, Sulfide, MEE, TOC, Fe^{+2}
3. Duplicate of MLS-3-5-R2
4. Duplicate of MLS-7-1-R2
5. Duplciate of MLS-13-3-R2

Acronyms:
bgs - below ground surface
CSIA - compound specific isotope analysis
Fe^{+2}- ferrous iron
ft - feet
MEE - methane/ethane/ethene
MNA - monitored natural attenuation
VOC - volatile organic compound
SIM - selective ion monitoring
SVOC - semivolatile organic compound
TOC - total organic carbon

CDM Smith

Table 2-6b
Round 2 Residential Well Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Location	Sample ID		Sample Date	Pump Intake (ft bgs)	VOCs	1,4-Dioxane
BYR-DW113	BYR-DW113B-R2	0003ROSB-F17	10/30/2017	--	X	X
	BYR-DW113A-R2	0003ROSA-F17	10/30/2017	--	X	X
BYR-DW114	BYR-DW114A-R2	0004ROSA-F17	11/3/2017	--	X	X
	BYR-DW114B-R2	0004ROSB-F17	11/3/2017	--	X	X
BYR-DW115	BYR-DW115A-R2	0005ROSA-F17	11/3/2017	--	X	X
	BYR-DW115B-R2	0005ROSB-F17	11/3/2017	--	X	X
BYR-DW117	BYR-DW117B-R2	0062BROB-F17	10/30/2017	80	X	X
	BYR-DW117A-R2	0062BROA-F17	10/30/2017	80	X	X
BYR-DW118	BYR-DW118B-R2	0064BROB-F17	10/31/2017	100	X	X
	BYR-DW118A-R2	0064BROA-F17	10/31/2017	100	X	X
BYR-DW119	BYR-DW119B-R2	0065BROB-F17	10/31/2017	--	X	X
	BYR-DW119A-R2	0065BROA-F17	10/31/2017	--	X	X
BYR-DW120	BYR-DW120A-R2	0066BROA-F17	11/1/2017	260	X	X
	BYR-DW120B-R2	0066BROB-F17	11/1/2017	260	X	X
BYR-DW122	BYR-DW122A-R2	0071BROA-F17	11/1/2017	45	X	X
	BYR-DW122B-R2	0071BROB-F17	11/1/2017	45	X	X
BYR-DW124	BYR-DW124B-R2	0069BROB-F17	10/30/2017	--	X	X
	BYR-DW124A-R2	0069BROA-F17	10/30/2017	--	X	X
BYR-DW125	BYR-DW125B-R2	0070BROB-F17	10/30/2017	--	X	X
	BYR-DW125A-R2	0070BROA-F17	10/30/2017	--	X	X
BYR-DW126	BYR-DW126B-R2	0068BROB-F17	10/31/2017	--	X	X
	BYR-DW126A-R2	0068BROA-F17	10/31/2017	--	X	X
BYR-DW127	BYR-DW127B-R2	0073BROB-F17	11/16/2017	100	X	X
	BYR-DW127A-R2	0073BROA-F17	11/16/2017	100	X	X
BYR-DW128	BYR-DW128B-R2	0074BROB-F17	11/27/2017	--	X	X
	BYR-DW128A-R2	0074BROA-F17	11/27/2017	--	X	X
BYR-DW129	BYR-DW129B-R2	0075BROB-F17	10/30/2017	120	X	X
	BYR-DW129A-R2	0075BROA-F17	10/30/2017	120	X	X
	BYR-DW129AD-R2[1]	0075BROAD-F17	10/30/2017	120	X	X
BYR-DW130[3]	BYR-DW170B-R2	0077BROB-F17	10/31/2017	--	X	X
	BYR-DW170A-R2	0077BROA-F17	10/31/2017	--	X	X
BYR-DW131	BYR-DW131B-R2	0079BROB-F17	10/30/2017	120	X	X
	BYR-DW131A-R2	0079BROA-F17	10/30/2017	120	X	X
BYR-DW159	BYR-DW159B-R2	0058BROB-F17	10/30/2017	--	X	X
	BYR-DW159A-R2	0058BROA-F17	10/30/2017	--	X	X

Notes:

1. Duplicate of BYR-DW129A-R2
2. PE sample
3. Initial sample was designated BYR-DW170, but upon review it was determined the home address was incorrectly labeled and the sample applied to the wrong residence

Acronyms:

A- after POET system
B - before POET system
bgs - below ground surface
ft - feet
ID - identification
PE - performance evaluation
VOC - volatile organic compounds
POET - point-of-entry treatment

Table 2-6c
Round 3 Monitoring Well Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well Type	Location	Sample ID	Sample Date	Sampling Depth (ft bgs)			VOCs	1,4-Dioxane
Multiport Wells	MLS-1	MLS-1-P1-R3	1/11/2018	30	-	45	X	
		MLS-1-P2-R3	1/11/2018	80	-	95	X	
		MLS-1-P3-R3	1/11/2018	107	-	122	X	
		MLS-1-P4-R3	1/11/2018	229	-	244	X	
		MLS-1-P5-R3	1/11/2018	285	-	300	X	
		MLS-1-P6-R3	1/11/2018	342	-	357	X	
	MLS-2	MLS-2-P1-R3	1/10/2018	35	-	50	X	X
		MLS-2-P2-R3	1/10/2018	55	-	70	X	
		MLS-2-P3-R3	1/10/2018	100	-	115	X	
		MLS-2-P4-R3	1/10/2018	119	-	134	X	
		MLS-2-P5-R3	1/10/2018	165	-	180	X	X
		MLS-2-P6-R3	1/10/2018	340	-	355	X	
	MLS-3	MLS-3-P1-R3	1/16/2018	65	-	80	X	X
		MLS-3-P2-R3	1/16/2018	110	-	125	X	
		MLS-3-P3-R3	1/16/2018	174	-	189	X	
		MLS-3-P4-R3	1/16/2018	215	-	230	X	X
		MLS-3-P5-R3	1/16/2018	240	-	255	X	
		MLS-3-P6-R3	1/16/2018	295	-	310	X	
		MLS-3-P7-R3	1/16/2018	325	-	340	X	X
	MLS-4	MLS-4-P1-R3	1/16/2018	73	-	88	X	X
		MLS-4-P2-R3	1/16/2018	110	-	125	X	
		MLS-4-P3-R3	1/16/2018	200	-	215	X	X
		MLS-4-P4-R3	1/16/2018	310	-	325	X	
		MLS-4-P5-R3	1/16/2018	361	-	376	X	
		MLS-4-P6-R3	1/16/2018	460	-	475	X	X
	MLS-5	MLS-5-P1-R3	1/10/2018	34	-	49	X	
		MLS-5-P2-R3	1/10/2018	75	-	90	X	X
		MLS-5-P2-R3-RS[1]	1/18/2018	75	-	90		X
		MLS-5-P3-R3	1/10/2018	102	-	117	X	
		MLS-5-P4-R3	1/10/2018	194	-	209	X	
		MLS-5-P5-R3	1/10/2018	313	-	328	X	X
	MLS-6	MLS-6-P1-R3	1/11/2018	30	-	45	X	
		MLS-6-P2-R3	1/11/2018	50	-	65	X	
		MLS-6-P3-R3	1/11/2018	110	-	125	X	X
		MLS-6-P4-R3	1/11/2018	160	-	175	X	
		MLS-96-P4-R3[2]	1/11/2018	160	-	175	X	
		MLS-6-P5-R3	1/11/2018	200	-	215	X	
		MLS-6-P6-R3	1/11/2018	235	-	250	X	
		MLS-6-P7-R3	1/11/2018	321	-	336	X	X

Table 2-6c
Round 3 Monitoring Well Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well Type	Location	Sample ID	Sample Date	Sampling Depth (ft bgs)			VOCs	1,4-Dioxane
Multiport Wells	MLS-7	MLS-7-P1-R3	1/11/2018	35	-	50	X	
		MLS-7-P2-R3	1/11/2018	67	-	82	X	
		MLS-7-P3-R3	1/11/2018	119	-	134	X	
		MLS-7-P4-R3	1/11/2018	270	-	285	X	X
		MLS-7-P5-R3	1/11/2018	376	-	391	X	
	MLS-8	MLS-8-P1-R3	1/12/2018	55	-	70	X	X
		MLS-8-P2-R3	1/12/2018	70	-	85	X	X
		MLS-8-P3-R3	1/12/2018	108	-	123	X	X
		MLS-8-P4-R3	1/12/2018	205	-	220	X	X
		MLS-98-P4-R3[3]	1/12/2018	205	-	220	X	X
		MLS-8-P5-R3	1/12/2018	235	-	250	X	X
		MLS-8-P6-R3	1/12/2018	281	-	296	X	X
	MLS-9	MLS-9-P1-R3	1/12/2018	54	-	69	X	X
		MLS-9-P2-R3	1/12/2018	82	-	97	X	X
		MLS-9-P3-R3	1/12/2018	100	-	115	X	X
		MLS-9-P4-R3	1/12/2018	125	-	140	X	X
		MLS-9-P5-R3	1/12/2018	175	-	190	X	X
		MLS-9-P6-R3	1/12/2018	271	-	286	X	X
	MLS-11	MLS-11-P1-R3	1/15/2018	59	-	74	X	X
		MLS-11-P2-R3	1/15/2018	100	-	115	X	X
		MLS-11-P3-R3	1/15/2018	119	-	134	X	X
		MLS-11-P4-R3	1/15/2018	165	-	180	X	X
		MLS-11-P5-R3	1/15/2018	277	-	292	X	X
		MLS-11-P6-R3	1/15/2018	352	-	367	X	X
	MLS-13	MLS-13-P1-R3	1/11/2018	40	-	55	X	X
		MLS-13-P2-R3	1/11/2018	65	-	80	X	
		MLS-13-P3-R3	1/11/2018	85	-	100	X	
		MLS-13-P4-R3	1/11/2018	170	-	185	X	
		MLS-13-P5-R3	1/11/2018	240	-	270	X	X
	MLS-14	MLS-14-P1-R3	1/15/2018	55	-	70	X	
		MLS-14-P2-R3	1/15/2018	97	-	112	X	
		MLS-14-P3-R3	1/15/2018	146	-	161	X	
		MLS-14-P4-R3	1/15/2018	170	-	185	X	X
		MLS-914-P4-R3[4]	1/15/2018	170	-	185	X	X

Table 2-6c
Round 3 Monitoring Well Sample Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well Type	Location	Sample ID	Sample Date	Sampling Depth (ft bgs)			VOCs	1,4-Dioxane
Monitoring Wells	MW-9	MW-9-R3	1/9/2018	40	-	50	X	X
	MW-10	MW-10-R3	1/9/2018	13	-	50	X	X
		MW-910-R3[5]	1/9/2018	13	-	50	X	X
	MW-15B	MW-15B-R3	1/9/2018	85	-	100	X	X
	MW-16	MW-16-R3	1/9/2018	185	-	200	X	X

Notes:

1. MLS-5-P2 was resampled due to insufficient volume for 1,4-Dioxane analysis.
2. Duplicate of MLS-6-P4-R3
3. Duplicate of MLS-8-P4-R3
4. Duplicate of MLS-14-P4-R3
5. Duplicate of MW-10-R3

Acronyms:

bgs - below ground surface
ft - feet
ID - identification
VOC - volatile organic compounds

Table 2-7a
Round 2 Groundwater Quality Readings
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample ID	Time HH:MM	Temp °C	Cond mS/cm	pH su	DO mg/L	Turbidity NTU	ORP mV	Ferrous Iron mg/L
Multiport Wells								
MLS-1-1-R2	14:58	12.16	0.154	4	1.16	11	154.2	0.02 U
MLS-1-2-R2	14:58	11.85	0.124	6.18	1.93	11	59.4	0.02 U
MLS-1-3-R2	14:58	13.54	0.134	6.15	1.93	1.42	70.4	0.02 U
MLS-1-4-R2	14:58	12.01	0.173	6.08	0.82	0.92	62	0.02 U
MLS-1-5-R2	14:58	11.75	0.17	6.3	2.81	0.2	56.7	0.02 U
MLS-1-6-R2	14:58	11.5	0.178	6.4	3.3	0.24	47	0.02 U
MLS-2-1-R2	NR	9.3	0.205	5.06	1.6	0.71	-13.2	NR
MLS-2-2-R2	NR	9.59	0.204	5.14	1.36	0.51	-36.9	NR
MLS-2-3-R2	NR	9.35	0.178	5.04	1.43	0.92	-40.4	NR
MLS-2-4-R2	NR	9.81	0.18	4.97	1.16	0.27	-33.7	NR
MLS-2-5-R2	NR	9.86	0.274	4.36	1.68	0.33	-178	NR
MLS-2-6-R2	NR	10.4	0.221	4.96	1.79	0.73	9.9	NR
MLS-3-1-R2	NR	8.72	0.138	8.67	4.71	0.75	-49.5	0.02 U
MLS-3-2-R2	NR	9.24	0.139	8.92	4.2	1.66	-102	0.02 U
MLS-3-3-R2	NR	6.47	0.273	7.15	5.54	1.09	-19.1	0.02 U
MLS-3-4-R2	NR	5.71	0.207	6.69	2.34	0.82	-20.3	0.02 U
MLS-3-5-R2	NR	8.69	0.203	4.97	4.88	0.87	21.5	0.02 U
MLS-3-6-R2	NR	8.08	0.198	5.91	2.24	0.51	13.1	0.02 U
MLS-3-7-R2	NR	8.3	0.18	5.83	2.07	0.29	11.2	0.02 U
MLS-4-1-R2	11:15	10.19	0.106	5.26	6.39	0.25	101.8	0.02 U
MLS-4-2-R2	11:15	10.56	0.101	4.86	6.01	0.62	168	0.02 U
MLS-4-3-R2	11:15	10.8	0.143	4.51	2.57	0.45	181.6	0.02 U
MLS-4-4-R2	11:15	NR	NR	NR	NR	NR	NR	0.02 U
MLS-4-5-R2	11:15	11.82	0.22	4.8	1.46	0.42	252	0.02 U
MLS-4-6-R2	11:15	10.57	0.263	5.4	1.22	0.4	-9.9	0.02 U
MLS-5-1-R2	NR	10.2	0.192	6.04	3.03	0.47	47.5	NR
MLS-5-2-R2	NR	10.03	0.193	4.85	1.63	0.57	150	NR
MLS-5-3-R2	NR	10.15	0.209	4.67	2.03	0.24	191.2	NR
MLS-5-4-R2	NR	9.74	0.256	4.75	1.01	0.26	180.6	NR
MLS-5-5-R2	NR	9.78	0.252	4.87	0.79	0.17	146.2	NR
MLS-6-1-R2	NR	9.47	0.282	4.55	0.98	0.63	15.6	NR
MLS-6-2-R2	NR	10.23	0.316	4.06	2.2	1.85	3.2	NR
MLS-6-3-R2	NR	9.78	0.269	4.17	2.09	1.97	83	NR
MLS-6-4-R2	NR	10.01	0.306	4.29	1.39	0.24	84.2	NR
MLS-6-5-R2	NR	10.31	0.185	4.75	0.87	0.57	72.2	NR
MLS-6-6-R2	NR	10.34	0.134	4.61	0.93	0.22	43.9	NR
MLS-6-7-R2	NR	10.46	2	3.42	0.99	1.64	86.5	NR
MLS-7-1-R2	NR	10.8	0.239	5.4	3.8	0.8	101	NR
MLS-7-2-R2	NR	11	0.358	5.6	1.4	0.3	30	NR

Table 2-7a
Round 2 Groundwater Quality Readings
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample ID	Time HH:MM	Temp °C	Cond mS/cm	pH su	DO mg/L	Turbidity NTU	ORP mV	Ferrous Iron mg/L
MLS-7-3-R2	NR	11.1	0.339	5.4	2.3	0.3	26	NR
MLS-7-4-R2	NR	11	0.273	5.4	1.5	0.2	91	NR
MLS-7-5-R2	NR	11.6	0.258	5	2.4	0.4	80	NR
MLS-8-1-R2	8:15	10.39	0.473	5.07	5.13	0.8	127.6	NR
MLS-8-2-R2	8:15	10.89	0.462	5.06	5.05	1.73	135.1	NR
MLS-8-3-R2	8:15	11.44	0.552	5.05	3.86	1.28	142.6	NR
MLS-8-4-R2	8:15	11.1	0.529	5.04	4.73	2.83	137.5	NR
MLS-8-5-R2	8:15	10.91	0.646	5.11	1.08	0.43	142.7	NR
MLS-8-6-R2	8:15	10.91	0.597	5.06	3.05	0.21	181	NR
MLS-9-1-R2	9:10	11.84	2.05	5.65	5.12	0.35	119	NR
MLS-9-2-R2	9:10	11.69	0.64	4.82	5.34	0.22	150	NR
MLS-9-3-R2	9:10	12.11	0.698	5.24	4.85	0.19	129	NR
MLS-9-4-R2	9:10	11.78	0.71	5.25	4.98	0.19	128.7	NR
MLS-9-5-R2	9:10	11.91	0.394	5.36	4.32	0.48	123	NR
MLS-9-6-R2	9:10	11.68	0.297	5.24	4.54	0.41	127	NR
MLS-11-1-R2	NR	11.25	0.655	4.88	2.05	0.57	144.6	NR
MLS-11-2-R2	NR	11.46	0.518	4.78	4.83	0.29	176	NR
MLS-11-3-R2	NR	11.38	0.492	3.97	3.44	0.18	234.1	NR
MLS-11-4-R2	NR	12.14	0.725	4.63	1.27	0.52	205.1	NR
MLS-11-5-R2	NR	10.83	0.319	5.08	1.73	0.27	175.4	NR
MLS-11-6-R2	NR	11.09	0.266	5.74	2.21	0.46	1.54	NR
MLS-13-1-R2	8:15	9.09	0.119	5.27	7.62	0.31	136.1	NR
MLS-13-2-R2	8:15	10.04	0.201	5.2	6	0.53	216.3	NR
MLS-13-3-R2	8:15	10.2	0.349	5.14	4.7	0.33	231	NR
MLS-13-4-R2	8:15	10.6	0.353	5.55	2.75	0.89	191	NR
MLS-13-5-R2	8:15	10.5	0.533	5.96	1.6	0.83	177	NR
MLS-14-1-R2	NR	10	0.667	5.8	2.4	1.2	135	NR
MLS-14-2-R2	NR	10.4	0.704	6	2.4	1.7	129	NR
MLS-14-3-R2	NR	10.4	2.208	6.4	2.8	0.2	115	NR
MLS-14-4-R2	NR	10.2	2.819	6.4	1.8	0.4	102	NR
Monitoring Wells								
MW-3-R2	12:50	6.76	0.177	6.1	6.93	20.2	128.3	NR
MW-4-R2	NR	NR	NR	NR	NR	NR	NR	0.09
MW-5-R2	14:10	15.18	0.15	5.82	1.17	0.92	272.4	0.02 U
MW-6-R2	12:50	9.68	0.573	6.12	1.74	8.29	127.1	0.02 U
MW-7-R2	13:00	15.48	0.214	7.07	0.59	5.23	226.3	0.02 U
MW-8-R2	NR	NR	NR	NR	NR	NR	NR	0.03
MW-9-R2	13:15	15.65	4.508	6.22	3.25	2.71	42.7	0.02 U
MW-10-R2	16:45	18	0.295	6.82	8.52	21.1	41	0.02 U

Table 2-7a
Round 2 Groundwater Quality Readings
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample ID	Time HH:MM	Temp °C	Cond mS/cm	pH su	DO mg/L	Turbidity NTU	ORP mV	Ferrous Iron mg/L
MW-11-R2	17:15	14.57	0.521	6.96	5.84	40.5	175.2	NR
MW-12-R2	15:50	9.04	0.406	5.63	5.63	5.39	106.4	NR
MW-13-R2	13:15	8.89	1.024	6.95	6.35	1.18	110.5	NR
MW-14-R2	14:03	14.7	0.759	6.1	1.7	11.8	240	NR
MW-15B-R2	16:25	11.69	1.827	7.89	0.32	2.79	-144.6	NR
MW-16-R2	14:35	12.18	1.081	9.16	0.83	1.26	-137.6	0.02 U
Piezometers								
OPZ-01-R2	15:10	12.51	0.421	5.5	0.54	NR	116.1	NR
OPZ-04-R2	13:04	11.47	0.519	7.14	10.6	NR	-2.4	NR
PZ-01-R2	14:30	11.49	0.463	6.32	0.54	NR	-11	NR
PZ-02-R2	11:42	9.4	0.501	7.46	10.6	NR	-44.6	NR
PZ-03-R2	13:37	10.24	0.657	6.75	0.76	NR	-65.6	NR
PZ-04-R2	11:50	10.69	0.461	7.02	7.8	NR	41.5	NR

Acronyms:

°C – degrees Celsius
DO – dissolved oxygen
H – hour
ID - identification
M – minute
mg/L – milligram per Liter
mS/cm – milliSiemens per centimeter
mV – millivolts
NR - not reported
NTU – nephelometric turbidity units
ORP – oxidation-reduction potential
su – standard units
U - non-detect

Table 2-7b
Round 3 Groundwater Quality Reading
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample ID	Time HH:MM	pH su	Cond mS/cm	DO mg/L	Temp °C	ORP mV	Turbidity NTU
Multiport Wells							
MLS-1-P1-R3	16:30	7.85	0.125	4.2	8.8	-59.7	1.71
MLS-1-P2-R3	16:40	7.8	0.131	2.81	8.73	-47.2	1.71
MLS-1-P3-R3	16:50	7.81	0.134	2.88	8.86	-37.7	1.31
MLS-1-P4-R3	17:00	7.78	0.159	2.66	9.44	-36.7	1.11
MLS-1-P5-R3	17:10	7.82	0.161	1.92	8.79	-35.3	1.31
MLS-1-P6-R3	17:20	7.78	0.165	1.72	8.73	-38.4	1.32
MLS-2-P1-R3	13:30	6.29	0.215	0.98	8.99	3.8	0.23
MLS-2-P2-R3	13:50	6.58	0.296	1.16	8.52	-16.3	0.3
MLS-2-P3-R3	14:10	7.04	0.176	1.46	8.85	19.4	0.31
MLS-2-P4-R3	14:30	7.18	0.173	1.32	8.92	26.9	0.31
MLS-2-P5-R3	14:50	7.16	0.236	0.66	8.26	-123.7	0.35
MLS-2-P6-R3	15:00	7.78	0.204	0.16	8.1	-57.6	0.4
MLS-3-P1-R3	14:40	7.73	0.121	3.76	7.57	70.7	10.03
MLS-3-P2-R3	14:50	7.46	0.143	2.45	6.16	57.7	1.79
MLS-3-P3-R3	15:00	7.89	0.183	2.48	6.2	43.7	1.73
MLS-3-P4-R3	15:10	7.69	0.177	3.78	7.41	20.8	1.55
MLS-3-P5-R3	15:20	7.81	0.181	1	7.75	5.2	1.08
MLS-3-P6-R3	15:30	6.65	0.18	5.41	1.54	62.7	1.21
MLS-3-P7-R3	15:40	7.38	0.151	5.47	3.55	38.8	0.92
MLS-4-P1-R3	13:20	6.97	0.095	2.23	7.18	-21	1.97
MLS-4-P2-R3	13:20	6.83	0.041	2.59	7.92	-15.1	2.96
MLS-4-P3-R3	13:20	6.78	0.08	2.41	7.62	-12.1	2.47
MLS-4-P4-R3	13:20	6.74	0.194	2.1	7.5	-10.4	2.61
MLS-4-P5-R3	13:20	6.96	0.178	1.85	7.17	-20.8	3.72
MLS-4-P6-R3	13:20	7.05	0.229	1.6	7.4	-20.2	4.38
MLS-5-P1-R3	13:50	6.3	0.189	6.54	9.45	36.8	0.38
MLS-5-P2-R3	12:36	6.36	0.212	3.18	9.44	44.1	0.34
MLS-5-P2-R3-RS	12:00	6.28	0.168	2.52	7.75	71.1	1.21
MLS-5-P3-R3	12:36	6.53	0.203	5.67	8.58	47	0.41
MLS-5-P4-R3	12:36	6.78	0.217	3.53	8.65	15	0.38
MLS-5-P5-R3	12:36	7.02	0.223	4.1	8.98	12.4	0.36
MLS-6-P1-R3	12:00	6.26	0.276	2.43	10.35	-7	1.36
MLS-6-P2-R3	12:10	6.27	0.331	2.08	10.12	2.6	1.43
MLS-6-P3-R3	12:20	6.82	0.272	1.77	10.37	-33.3	1.45
MLS-6-P4-R3	12:40	6.72	0.259	1.7	9.43	-25.7	1.71
MLS-6-P5-R3	12:50	6.97	0.17	2.3	10.19	-41.3	1.32
MLS-6-P6-R3	13:00	7.02	0.136	2.26	10.33	-41	1.32
MLS-6-P7-R3	13:10	7.02	0.174	2.25	9.83	-47	1.55
MLS-7-P1-R3	10:42	6.88	0.283	4.34	8.84	-54.3	0.08

Table 2-7b
Round 3 Groundwater Quality Reading
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample ID	Time HH:MM	pH su	Cond mS/cm	DO mg/L	Temp °C	ORP mV	Turbidity NTU
MLS-7-P2-R3	10:43	6.73	0.343	3.78	8.79	-49.4	0.47
MLS-7-P3-R3	10:44	6.9	0.348	5.32	8.73	-63.6	0.47
MLS-7-P4-R3	10:45	7.09	0.264	5.43	9.21	-65.3	0.17
MLS-7-P5-R3	10:46	7.2	0.25	4.86	9.21	-61.5	0.31
MLS-8-P1-R3	14:20	6.37	1.89	1.75	12.83	185.1	1.98
MLS-8-P2-R3	14:20	6.88	1.773	1.49	11.8	160.6	1.59
MLS-8-P3-R3	14:20	7.11	1.442	1.13	12.56	165.5	1.92
MLS-8-P4-R3	14:40	7.11	1.219	1.86	12.48	175.6	2.38
MLS-8-P5-R3	14:40	8.02	0.809	1.02	12.56	-0.5	1.26
MLS-8-P6-R3	16:10	7.87	0.612	1.68	12.13	26.3	1.92
MLS-9-P1-R3	13:30	6.7	1.838	2.49	12.15	103.9	0.05
MLS-9-P2-R3	13:40	6.59	0.664	2.67	12.14	86.7	0.01
MLS-9-P3-R3	13:50	6.46	0.65	2.83	12.13	89.1	0.02
MLS-9-P4-R3	14:00	6.53	0.672	2.93	11.9	88.2	0.03
MLS-9-P5-R3	14:10	6.83	0.395	3.23	11.84	79.8	0.02
MLS-9-P6-R3	14:20	7.06	0.295	3.28	11.9	75	0.02
MLS-11-P1-R3	14:00	6.74	0.43	6.28	9.3	62.6	1.57
MLS-11-P2-R3	14:02	6.34	0.48	1.31	11.35	135.1	1.09
MLS-11-P3-R3	14:03	7.06	0.393	4.62	9.23	55.2	1.17
MLS-11-P4-R3	14:06	6.95	0.493	1.33	9.24	139.8	1.11
MLS-11-P5-R3	14:07	7.33	0.296	3.82	8.52	50.2	1.3
MLS-11-P6-R3	14:08	7.42	0.229	5.02	8.07	47.6	2.08
MLS-13-P1-R3	14:36	9.51	0.121	8.04	9.51	3.8	0.8
MLS-13-P2-R3	14:37	9.57	0.173	9.68	9.25	16	0.06
MLS-13-P3-R3	14:38	9.18	0.368	8.92	9.52	28.2	0.06
MLS-13-P4-R3	14:39	9.92	0.384	7.12	9.39	20.1	0.3
MLS-13-P5-R3	14:50	10.95	0.491	6.51	8.09	5.4	0.11
MLS-14-P1-R3	15:50	9.47	0.598	0.31	6.01	161.8	0.38
MLS-14-P2-R3	16:00	9.38	0.412	0.45	8.25	133.4	0.46
MLS-14-P3-R3	16:10	9.91	0.385	0.32	8.86	124.8	0.61
MLS-14-P4-R3	16:20	11.45	0.472	0.3	7.23	72.2	0.56
Monitoring Wells							
MW-9-R3	12:40	6.13	3.362	2.71	55.88	176.1	4.42
MW-10-R3	12:05	6.68	0.185	9.85	12.61	86.8	16.85
MW-15B-R3	14:54	7.85	1.446	0.29	10.39	-49	1.53
MW-16-R3	15:25	8.38	0.858	0.88	49.67	-58	11.2

Acronyms:

°C – degrees Celsius
DO – dissolved oxygen
H – hour
ID - identification
M – minute
mg/L – milligram per Liter
mS/cm – milliSiemens per centimeter
mV – millivolts
NTU – nephelometric turbidity units
ORP – oxidation-reduction potential
su – standard units
U - non-detect

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-1	914.981	31.06	883.921	169.42	12.47	2	Hairline Fracture/Feature	Source Area	
	914.981	31.6	883.381	153.75	56.82	2	Hairline Fracture/Feature	Source Area	
	914.981	33.6	881.381	33.99	23.36	2	Hairline Fracture/Feature	Source Area	
	914.981	36.85	878.131	201.07	8.79	2	Hairline Fracture/Feature	Source Area	
	914.981	37.81	877.171	227.72	74.29	2	Hairline Fracture/Feature	Source Area	
	914.981	38.08	876.901	239.02	59.88	2	Hairline Fracture/Feature	Source Area	
	914.981	38.88	876.101	136.57	9.09	2	Hairline Fracture/Feature	Source Area	
	914.981	42.64	872.341	158.24	13.27	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	45.9	869.081	153.99	15.91	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	50.84	864.141	344.49	11.75	3	Hairline Fracture/Feature	Source Area	
	914.981	52.69	862.291	335.63	4.18	3	Hairline Fracture/Feature	Source Area	
	914.981	54.54	860.441	148.32	38.58	1	Hairline Fracture/Feature	Source Area	
	914.981	56.05	858.931	132.24	43.53	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	57.36	857.621	136.75	12.48	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	58.99	855.991	2.28	11.03	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	61.13	853.851	253.13	76.46	2	Hairline Fracture/Feature	Source Area	
	914.981	64.76	850.221	283	56.37	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	79.14	835.841	207.01	45.2	2	Hairline Fracture/Feature	Source Area	
	914.981	85.2	829.781	134.52	42.85	2	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	86.05	828.931	138.32	29.08	1	Hairline Fracture/Feature	Source Area	
	914.981	87.17	827.811	123.52	39.41	2	Hairline Fracture/Feature	Source Area	
	914.981	88.09	826.891	339.54	6.9	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	89.7	825.281	280.25	10.65	2	Hairline Fracture/Feature	Source Area	
	914.981	106.1	808.881	119.37	11.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	106.58	808.401	259.53	51.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	108.91	806.071	88.98	50.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	112.59	802.391	30.44	13.06	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	113.94	801.041	142.11	22.69	3	Hairline Fracture/Feature	Source Area	
	914.981	117.73	797.251	16.96	36.64	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	123.8	791.181	284.67	28.4	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	128.52	786.461	288.75	28.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	158.03	756.951	269.76	75.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	158.37	756.611	268.75	64.12	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	159.21	755.771	128.89	9.93	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	159.86	755.121	111.48	13.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	175.11	739.871	274.42	86.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	179.11	735.871	272.66	67.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	184.11	730.871	358.9	13.68	2	Hairline Fracture/Feature	Source Area	
	914.981	192.46	722.521	250.3	61.01	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	203.51	711.471	162.29	44.23	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	211.67	703.311	230.81	74.43	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	215.51	699.471	282.41	53.78	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	217.73	697.251	262.96	45.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	218.17	696.811	276.29	45.33	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	229.66	685.321	113.64	26.57	1	Hairline Fracture/Feature	Source Area	
	914.981	233.88	681.101	239.48	43.49	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	235.49	679.491	248.69	62.11	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	240.46	674.521	77.49	22.53	3	Hairline Fracture/Feature	Source Area	
	914.981	281.07	633.911	129.75	38.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	287.46	627.521	144.41	24.63	2	Hairline Fracture/Feature	Source Area	
	914.981	288.28	626.701	91.51	6.42	2	Hairline Fracture/Feature	Source Area	
	914.981	289.24	625.741	130.5	38.25	2	Hairline Fracture/Feature	Source Area	
	914.981	289.9	625.081	157.91	36.12	2	Hairline Fracture/Feature	Source Area	
	914.981	294.01	620.971	158.23	13.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	294.64	620.341	329.8	30.57	2	Hairline Fracture/Feature	Source Area	
	914.981	296.74	618.241	316.77	27.84	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	307.1	607.881	274.32	57.64	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	308.17	606.811	278.37	29	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	310.2	604.781	155.54	24.93	3	Hairline Fracture/Feature	Source Area	
	914.981	313.66	601.321	285.35	27.92	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	314.7	600.281	284.24	31.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	315.75	599.231	297.71	42.92	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	317.31	597.671	125.67	27.64	3	Hairline Fracture/Feature	Source Area	
	914.981	318.52	596.461	276.07	42.21	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	319.74	595.241	123.02	10.1	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	339.77	575.211	281.56	27.74	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	341.77	573.211	79.86	57.47	3	Hairline Fracture/Feature	Source Area	
	914.981	349.34	565.641	134.75	26.35	3	Hairline Fracture/Feature	Source Area	
	914.981	351.4	563.581	116.98	33.13	3	Hairline Fracture/Feature	Source Area	
	914.981	362.42	552.561	146.75	26.16	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.981	369.18	545.801	119.83	29.9	3	Hairline Fracture/Feature	Source Area	
MLS-2	914.881	25.85	889.031	347.55	25.44	3	Hairline Fracture/Feature	Source Area	
	914.881	36.41	878.471	124.05	57.21	3	Hairline Fracture/Feature	Source Area	
	914.881	40.88	874.001	28.99	40.16	3	Hairline Fracture/Feature	Source Area	
	914.881	42.74	872.141	51.64	44.11	3	Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-2	914.881	53.76	861.121	94.74	50.92	3	Hairline Fracture/Feature	Source Area	
	914.881	54.4	860.481	102.06	66.46	3	Hairline Fracture/Feature	Source Area	
	914.881	55.44	859.441	70.2	44.24	3	Hairline Fracture/Feature	Source Area	
	914.881	56.79	858.091	145.6	65.83	3	Hairline Fracture/Feature	Source Area	
	914.881	63.52	851.361	75.55	43.98	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	74.73	840.151	117.81	80.7	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	98.92	815.961	87.71	74.18	2	Hairline Fracture/Feature	Source Area	
	914.881	108.84	806.041	308.18	69.59	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	109.87	805.011	351.6	62.69	3	Hairline Fracture/Feature	Source Area	
	914.881	234.87	680.011	307.97	72.19	3	Hairline Fracture/Feature	Source Area	
	914.881	305.94	608.941	288.04	60.61	2	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	315.91	598.971	272.97	69.31	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	329.56	585.321	111.4	31.9	3	Discontinuous Hairline Fracture/Feature	Source Area	
	914.881	350.97	563.911	343.99	23.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
MLS-3	948.558	61.63	886.928	315.69	58.29	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	61.73	886.828	243.94	80.59	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	62.64	885.918	323.27	69.62	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	63.09	885.468	316.29	71.42	2	Hairline Fracture/Feature	Source Area	
	948.558	64.48	884.078	326.06	57.75	2	Hairline Fracture/Feature	Source Area	
	948.558	65.87	882.688	304.16	76.69	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	67.19	881.368	314.82	51.7	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	68.74	879.818	314.71	74.04	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	71.38	877.178	315.62	61.39	2	Hairline Fracture/Feature	Source Area	
	948.558	72.49	876.068	292.95	60.63	2	Hairline Fracture/Feature	Source Area	
	948.558	72.99	875.568	297.79	81.43	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	77.92	870.638	297.54	67.3	2	Hairline Fracture/Feature	Source Area	
	948.558	78.88	869.678	308.52	57.74	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	80.47	868.088	271.2	68.99	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	84.76	863.798	325.47	50.26	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	92.53	856.028	283.2	70.25	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	96.15	852.408	313.82	70.06	2	Hairline Fracture/Feature	Source Area	
	948.558	98.26	850.298	159.8	67.08	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	109.15	839.408	333.46	23.38	1	Hairline Fracture/Feature	Source Area	
	948.558	109.46	839.098	140.33	15.02	1	Hairline Fracture/Feature	Source Area	
	948.558	111.29	837.268	323.03	72.41	1	Hairline Fracture/Feature	Source Area	
	948.558	118.78	829.778	156.31	18.94	1	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	119.35	829.208	299.29	42.37	1	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	121.85	826.708	320	42.46	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	122.22	826.338	299.77	81.2	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	139.82	808.738	329.14	64.58	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	153.83	794.728	315.9	41.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	154.85	793.708	307.46	52.81	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	157.8	790.758	7.72	57.23	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	168.77	779.788	290.65	51.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	171.55	777.008	26.2	30.57	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	173.44	775.118	27.23	55.18	1	Hairline Fracture/Feature	Source Area	
	948.558	185.69	762.868	320.33	32.87	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	186.31	762.248	354.86	60.4	1	Hairline Fracture/Feature	Source Area	
	948.558	187.16	761.398	305.87	30.64	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	189.59	758.968	291.28	78.3	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	190.23	758.328	116.08	42.51	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	192.71	755.848	116.08	36.54	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	197.56	750.998	138.12	28.54	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	198.93	749.628	110.74	34.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	200.98	747.578	91.1	36.63	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	205.08	743.478	315.55	74.53	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	218.8	729.758	239.25	79.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	222.12	726.438	312.79	50.12	1	Hairline Fracture/Feature	Source Area	
	948.558	245.61	702.948	291.05	26.73	1	Fracture/Feature	Source Area	
	948.558	259.78	688.778	350.77	78.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	261.58	686.978	3.88	79.51	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	262.7	685.858	181.47	35.84	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	264.52	684.038	10	66.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	269.18	679.378	23.51	59.03	2	Hairline Fracture/Feature	Source Area	
	948.558	269.35	679.208	273.4	77.35	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	269.54	679.018	262.42	82.44	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	272.74	675.818	120.59	21.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	274.14	674.418	272.59	83.42	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	275.85	672.708	165.31	11.27	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	277.54	671.018	265.75	75.77	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	279.92	668.638	157.14	37.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	281.15	667.408	276.92	69.09	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	284.09	664.468	250.88	82.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	285.45	663.108	6.48	66.8	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	293.08	655.478	258.84	57.19	2	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-3	948.558	294.2	654.358	259.66	76.62	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	295.07	653.488	268.07	68.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	296.63	651.928	119.26	60.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	301.73	646.828	359.93	76.29	1	Fracture/Feature	Source Area	
	948.558	302.45	646.108	263.66	64.51	1	Hairline Fracture/Feature	Source Area	
	948.558	304.94	643.618	146.44	42.41	1	Hairline Fracture/Feature	Source Area	
	948.558	307.95	640.608	143.27	47.77	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	313.02	635.538	8.08	65.25	1	Hairline Fracture/Feature	Source Area	
	948.558	317.87	630.688	157.22	20.6	1	Hairline Fracture/Feature	Source Area	
	948.558	320.22	628.338	289.34	26.45	1	Hairline Fracture/Feature	Source Area	
	948.558	330.99	617.568	329.64	58.06	3	Hairline Fracture/Feature	Source Area	
	948.558	334.18	614.378	164.41	54.73	2	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	335.09	613.468	140.7	62.63	3	Bedding/Change in Lithology	Source Area	
	948.558	335.19	613.368	140.33	36.93	2	Hairline Fracture/Feature	Source Area	
	948.558	349.51	599.048	153.99	45.2	3	Discontinuous Hairline Fracture/Feature	Source Area	
	948.558	352.97	595.588	73.7	30.42	3	Bedding/Change in Lithology	Source Area	
	948.558	363.66	584.898	151.35	42.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
MLS-4	955.771	19.34	936.431	151.63	39.13	2	Hairline Fracture/Feature	Source Area	
	955.771	21.61	934.161	142.18	62.42	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	24.74	931.031	181.23	66.32	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	27.83	927.941	286.09	67.37	2	Hairline Fracture/Feature	Source Area	
	955.771	28.47	927.301	285.13	46.6	2	Hairline Fracture/Feature	Source Area	
	955.771	28.87	926.901	282.2	54.83	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	34.22	921.551	274.58	50.37	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	37.7	918.071	305.45	54.58	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	37.76	918.011	293.72	70.67	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	39.08	916.691	312.89	55.78	2	Hairline Fracture/Feature	Source Area	
	955.771	39.58	916.191	304.81	70.81	2	Hairline Fracture/Feature	Source Area	
	955.771	41.09	914.681	302.19	62.57	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	42.27	913.501	338.55	48.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	43.56	912.211	285.43	55.18	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	44.53	911.241	298.99	51.43	2	Hairline Fracture/Feature	Source Area	
	955.771	46.45	909.321	297.85	60.11	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	47.51	908.261	281.14	44.59	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	47.85	907.921	282.01	53.93	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	50.4	905.371	277.03	59.94	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	51.05	904.721	271.56	60.71	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	57.03	898.741	357.32	52.21	2	Hairline Fracture/Feature	Source Area	
	955.771	57.31	898.461	349.11	47.44	2	Hairline Fracture/Feature	Source Area	
	955.771	62.04	893.731	347.9	34.84	2	Hairline Fracture/Feature	Source Area	
	955.771	72.71	883.061	136.62	47.26	2	Hairline Fracture/Feature	Source Area	
	955.771	73.71	882.061	262.23	53.98	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	73.99	881.781	302.16	45.21	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	74.27	881.501	267.91	45.37	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	77.12	878.651	331.37	51.78	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	79.36	876.411	30.01	23.76	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	79.85	875.921	248.77	62.83	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	79.94	875.831	4.41	57.41	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	87.16	868.611	337.86	35.58	3	Bedding/Change in Lithology	Source Area	
	955.771	87.55	868.221	336.96	60.84	2	Hairline Fracture/Feature	Source Area	
	955.771	89.25	866.521	337.34	54.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	92.43	863.341	234.05	68.73	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	93.78	861.991	255.76	47.98	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	95.21	860.561	121.42	21.94	2	Bedding/Change in Lithology	Source Area	
	955.771	96.53	859.241	230.48	84.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	96.84	858.931	336.21	43.67	3	Hairline Fracture/Feature	Source Area	
	955.771	98.34	857.431	230.6	63.94	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	99.44	856.331	287.7	58.51	3	Hairline Fracture/Feature	Source Area	
	955.771	99.99	855.781	273.82	61.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	100.28	855.491	260.16	46.4	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	100.71	855.061	254.14	60.06	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	107.13	848.641	285.27	42.58	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	107.62	848.151	299.63	48.08	2	Hairline Fracture/Feature	Source Area	
	955.771	110.77	845.001	297.27	52.58	2	Hairline Fracture/Feature	Source Area	
	955.771	111.21	844.561	290.37	57.11	2	Hairline Fracture/Feature	Source Area	
	955.771	116.25	839.521	271.25	59.32	2	Hairline Fracture/Feature	Source Area	
	955.771	116.47	839.301	279.77	58.85	2	Hairline Fracture/Feature	Source Area	
	955.771	116.72	839.051	276.6	56.02	2	Hairline Fracture/Feature	Source Area	
	955.771	117.15	838.621	281.86	54.58	2	Hairline Fracture/Feature	Source Area	
	955.771	117.46	838.311	276.58	57.7	2	Hairline Fracture/Feature	Source Area	
	955.771	119.01	836.761	274.95	58.22	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	119.98	835.791	274.74	56.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	120.82	834.951	274.28	57.73	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	121.35	834.421	289.17	59.15	2	Hairline Fracture/Feature	Source Area	
	955.771	122.26	833.511	274.2	60.91	2	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
	955.771	122.52	833.251	269.06	66.97	2	Hairline Fracture/Feature	Source Area	
	955.771	123.12	832.651	271.22	63.95	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	125.16	830.611	260.22	70.93	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	126.82	828.951	309.6	50.49	2	Hairline Fracture/Feature	Source Area	
	955.771	127.69	828.081	275.22	64.36	2	Hairline Fracture/Feature	Source Area	
	955.771	128.46	827.311	274.76	70.12	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	130.08	825.691	317.23	45.25	2	Hairline Fracture/Feature	Source Area	
	955.771	130.99	824.781	295.99	82.54	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	132.15	823.621	280.51	60.63	2	Hairline Fracture/Feature	Source Area	
	955.771	132.62	823.151	281.8	64.68	2	Hairline Fracture/Feature	Source Area	
	955.771	134.11	821.661	282.6	41.03	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	135.18	820.591	267.8	61.15	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	138.16	817.611	133.06	62.71	3	Bedding/Change in Lithology	Source Area	
	955.771	143.78	811.991	290.16	45.13	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	147.15	808.621	53.35	50.76	2	Bedding/Change in Lithology	Source Area	
	955.771	148.34	807.431	7.39	71.04	2	Bedding/Change in Lithology	Source Area	
	955.771	149.55	806.221	148.17	31.95	2	Bedding/Change in Lithology	Source Area	
	955.771	152.73	803.041	138.24	38.34	3	Hairline Fracture/Feature	Source Area	
	955.771	154.66	801.111	266.65	66.66	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	154.87	800.901	341.01	45.74	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	154.93	800.841	233.28	74.3	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	155.71	800.061	135.1	46.02	3	Hairline Fracture/Feature	Source Area	
	955.771	156.36	799.411	155.28	45.41	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	157.55	798.221	229.02	65.61	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	159.31	796.461	294.75	62.59	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	159.85	795.921	274.67	73.25	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	160.75	795.021	282.62	66.43	3	Hairline Fracture/Feature	Source Area	
	955.771	167.08	788.691	277.14	43.5	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	173.82	781.951	282.91	55.69	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	174.81	780.961	273.89	53.16	3	Hairline Fracture/Feature	Source Area	
	955.771	176.03	779.741	336.3	50.47	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	176.08	779.691	90.23	71.27	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	178.49	777.281	279.88	54.31	3	Hairline Fracture/Feature	Source Area	
	955.771	179.07	776.701	279.93	56.79	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	179.65	776.121	276.49	37.37	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	182.24	773.531	255.51	36.24	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	182.3	773.471	301.2	64.26	3	Discontinuous Hairline Fracture/Feature	Source Area	
MLS-4	955.771	183.46	772.311	304.88	49.59	1	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	187.23	768.541	278.47	46.4	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	188.19	767.581	289.61	45.67	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	188.61	767.161	277.43	45.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	188.98	766.791	257.82	40.59	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	190.06	765.711	266.68	66.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	190.53	765.241	321.75	46.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	190.67	765.101	116.08	48.07	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	190.89	764.881	277.92	71.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	192.45	763.321	275.85	49.45	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	192.73	763.041	280.49	48.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	195.2	760.571	285.88	60.04	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	196	759.771	342.66	53.95	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	196.14	759.631	216.53	43.1	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	196.51	759.261	219.01	58.78	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	196.85	758.921	223.48	64.22	3	Hairline Fracture/Feature	Source Area	
	955.771	197.44	758.331	205.1	36.96	2	Hairline Fracture/Feature	Source Area	
	955.771	197.75	758.021	224.49	21.29	2	Hairline Fracture/Feature	Source Area	
	955.771	198.18	757.591	141.88	50.8	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	202.6	753.171	261.37	32.52	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	205.55	750.221	267.52	34.74	2	Hairline Fracture/Feature	Source Area	
	955.771	207.97	747.801	116.81	36.12	3	Bedding/Change in Lithology	Source Area	
	955.771	208.99	746.781	128.27	43.39	2	Hairline Fracture/Feature	Source Area	
	955.771	212.65	743.121	95.15	48.14	2	Bedding/Change in Lithology	Source Area	
	955.771	214.19	741.581	84.67	46.72	3	Bedding/Change in Lithology	Source Area	
	955.771	221.88	733.891	108.85	50.11	3	Bedding/Change in Lithology	Source Area	
	955.771	223.62	732.151	102.97	49.72	3	Bedding/Change in Lithology	Source Area	
	955.771	224.94	730.831	103.49	51.98	3	Bedding/Change in Lithology	Source Area	
	955.771	227.22	728.551	81.85	46.17	3	Bedding/Change in Lithology	Source Area	
	955.771	228.48	727.291	116.2	36.62	3	Bedding/Change in Lithology	Source Area	
	955.771	229.88	725.891	108.69	51.65	3	Hairline Fracture/Feature	Source Area	
	955.771	233.37	722.401	100.17	44.09	3	Bedding/Change in Lithology	Source Area	
	955.771	234.2	721.571	98.39	22.27	3	Bedding/Change in Lithology	Source Area	
	955.771	234.55	721.221	166.99	54.29	3	Bedding/Change in Lithology	Source Area	
	955.771	239	716.771	154.04	29.06	3	Bedding/Change in Lithology	Source Area	
	955.771	241.72	714.051	208.41	78.64	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	243.39	712.381	52.14	77.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	243.39	712.381	230.87	77.72	2	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-4	955.771	245.5	710.271	53.66	79.49	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	252.73	703.041	120.35	35.92	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	254.67	701.101	220.27	61.93	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	254.89	700.881	121.11	74.98	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	256.81	698.961	334.3	51.3	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	257.31	698.461	187.58	18.19	3	Bedding/Change in Lithology	Source Area	
	955.771	257.91	697.861	205.37	13.87	3	Bedding/Change in Lithology	Source Area	
	955.771	259.41	696.361	142.14	23.03	3	Bedding/Change in Lithology	Source Area	
	955.771	262.97	692.801	245.36	22.09	2	Hairline Fracture/Feature	Source Area	
	955.771	263.78	691.991	123.78	43.38	3	Bedding/Change in Lithology	Source Area	
	955.771	264.98	690.791	230.44	24.34	3	Bedding/Change in Lithology	Source Area	
	955.771	266.38	689.391	219.14	53.41	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	268.57	687.201	304.64	81.3	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	270.24	685.531	140.38	35.69	2	Hairline Fracture/Feature	Source Area	
	955.771	271.73	684.041	275.47	76.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	273.92	681.851	107.28	42.23	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	281.36	674.411	262.75	67.75	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	282.89	672.881	278.76	14.14	2	Hairline Fracture/Feature	Source Area	
	955.771	286.27	669.501	199.93	51.95	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	287.53	668.241	306.95	46.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	288.09	667.681	117.1	32.74	2	Hairline Fracture/Feature	Source Area	
	955.771	290.55	665.221	141.71	36.99	2	Hairline Fracture/Feature	Source Area	
	955.771	293.57	662.201	148.51	31.77	2	Hairline Fracture/Feature	Source Area	
	955.771	295.44	660.331	168.7	8.95	2	Bedding/Change in Lithology	Source Area	
	955.771	296.86	658.911	124.7	35.28	2	Hairline Fracture/Feature	Source Area	
	955.771	297.4	658.371	116.97	32.35	2	Hairline Fracture/Feature	Source Area	
	955.771	298.13	657.641	239.35	62.59	2	Hairline Fracture/Feature	Source Area	
	955.771	298.6	657.171	201.45	22.27	2	Bedding/Change in Lithology	Source Area	
	955.771	298.92	656.851	247.72	65.83	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	300.65	655.121	264.38	47.17	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	302.57	653.201	152.24	26.75	2	Bedding/Change in Lithology	Source Area	
	955.771	308.4	647.371	159.77	20.7	2	Bedding/Change in Lithology	Source Area	
	955.771	311.61	644.161	7.48	8.38	2	Bedding/Change in Lithology	Source Area	
	955.771	312.54	643.231	69.2	8.04	2	Bedding/Change in Lithology	Source Area	
	955.771	312.67	643.101	13.37	12.43	1	Hairline Fracture/Feature	Source Area	
	955.771	313.89	641.881	226.76	79.86	2	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	321.33	634.441	57.22	8.8	2	Bedding/Change in Lithology	Source Area	
	955.771	321.45	634.321	257.73	19.27	2	Hairline Fracture/Feature	Source Area	
	955.771	324.36	631.411	48.67	59.38	2	Hairline Fracture/Feature	Source Area	
	955.771	324.62	631.151	51.76	63.18	2	Hairline Fracture/Feature	Source Area	
	955.771	326.65	629.121	206.91	29.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	327.4	628.371	218.06	36.81	3	Hairline Fracture/Feature	Source Area	
	955.771	333.01	622.761	208.65	10.7	3	Hairline Fracture/Feature	Source Area	
	955.771	333.91	621.861	113.88	14.14	3	Hairline Fracture/Feature	Source Area	
	955.771	334.27	621.501	147.43	18.17	3	Hairline Fracture/Feature	Source Area	
	955.771	335.95	619.821	144.42	36.26	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	337.64	618.131	166.03	69.52	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	347.25	608.521	289.69	60.45	3	Hairline Fracture/Feature	Source Area	
	955.771	347.56	608.211	168.43	29.83	3	Bedding/Change in Lithology	Source Area	
	955.771	350.04	605.731	288.06	56.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	353.42	602.351	99.08	62.79	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	356.12	599.651	229.82	13.71	3	Bedding/Change in Lithology	Source Area	
	955.771	361.32	594.451	241.39	17.55	3	Bedding/Change in Lithology	Source Area	
	955.771	361.41	594.361	134.59	69.51	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	363.54	592.231	121.75	50.26	3	Hairline Fracture/Feature	Source Area	
	955.771	365.65	590.121	330.12	32.03	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	365.97	589.801	111.23	78.84	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	367.65	588.121	80.49	82.36	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	368.58	587.191	151.68	29.77	3	Bedding/Change in Lithology	Source Area	
	955.771	369.46	586.311	244.28	49.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	370.62	585.151	191.18	41.78	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	371.49	584.281	179.15	27.57	2	Hairline Fracture/Feature	Source Area	
	955.771	371.7	584.071	135.26	44.75	3	Hairline Fracture/Feature	Source Area	
	955.771	372.75	583.021	335.66	70.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	373.56	582.211	335.82	44.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	380.64	575.131	133.23	22.84	3	Bedding/Change in Lithology	Source Area	
	955.771	385.46	570.311	135.08	39.33	3	Bedding/Change in Lithology	Source Area	
	955.771	387.95	567.821	161.42	46.68	3	Bedding/Change in Lithology	Source Area	
	955.771	394.18	561.591	115.61	54.83	3	Bedding/Change in Lithology	Source Area	
	955.771	398.21	557.561	150.71	59.16	3	Bedding/Change in Lithology	Source Area	
	955.771	398.81	556.961	134.3	48.87	3	Hairline Fracture/Feature	Source Area	
	955.771	403.86	551.911	153.74	73.29	3	Bedding/Change in Lithology	Source Area	
	955.771	407.61	548.161	311.32	40.33	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	407.66	548.111	173.19	51.74	3	Hairline Fracture/Feature	Source Area	
	955.771	408.51	547.261	342.52	55.02	3	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-4	955.771	409.86	545.911	96.51	49.23	3	Bedding/Change in Lithology	Source Area	
	955.771	411.26	544.511	155.8	51.03	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	412.08	543.691	160.22	56.12	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	412.55	543.221	153.78	48.93	3	Hairline Fracture/Feature	Source Area	
	955.771	413.61	542.161	148.22	49.32	3	Hairline Fracture/Feature	Source Area	
	955.771	415.4	540.371	161.13	47.97	3	Bedding/Change in Lithology	Source Area	
	955.771	418.65	537.121	117.09	64.91	3	Bedding/Change in Lithology	Source Area	
	955.771	419.7	536.071	136.27	56.08	3	Bedding/Change in Lithology	Source Area	
	955.771	421.37	534.401	29.2	11.61	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	421.51	534.261	158.59	27.71	3	Bedding/Change in Lithology	Source Area	
	955.771	422.69	533.081	164.34	57.48	3	Bedding/Change in Lithology	Source Area	
	955.771	425.73	530.041	118.48	60.18	3	Hairline Fracture/Feature	Source Area	
	955.771	428.85	526.921	90.35	36.58	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	431.74	524.031	127.21	50.73	3	Bedding/Change in Lithology	Source Area	
	955.771	438.24	517.531	150.88	50.45	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	443.09	512.681	158.25	57.35	3	Bedding/Change in Lithology	Source Area	
	955.771	451.28	504.491	178.98	57.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	452.61	503.161	125.32	61.68	3	Bedding/Change in Lithology	Source Area	
	955.771	453.12	502.651	127.76	37.44	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	457.58	498.191	152.91	47.1	3	Hairline Fracture/Feature	Source Area	
	955.771	457.98	497.791	154.52	33.81	3	Hairline Fracture/Feature	Source Area	
	955.771	460.79	494.981	153.67	45.25	3	Bedding/Change in Lithology	Source Area	
	955.771	461.67	494.101	154.54	75.7	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	465.6	490.171	133.58	53.6	3	Bedding/Change in Lithology	Source Area	
	955.771	467.81	487.961	180.69	68.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	469.13	486.641	146.54	66.75	3	Bedding/Change in Lithology	Source Area	
	955.771	471.91	483.861	141.06	46.39	2	Bedding/Change in Lithology	Source Area	
	955.771	474.14	481.631	173.33	62.73	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	479.43	476.341	177.65	11.21	3	Discontinuous Hairline Fracture/Feature	Source Area	
	955.771	483.47	472.301	115.29	63.58	3	Discontinuous Hairline Fracture/Feature	Source Area	
MLS-5	917.861	24.29	893.571	182.39	50.58	3	Hairline Fracture/Feature	Source Area	
	917.861	25.73	892.131	184.5	46.52	3	Hairline Fracture/Feature	Source Area	
	917.861	26.77	891.091	132.65	39.81	3	Hairline Fracture/Feature	Source Area	
	917.861	27.13	890.731	251.41	37.76	3	Hairline Fracture/Feature	Source Area	
	917.861	28.79	889.071	162.45	43.35	3	Hairline Fracture/Feature	Source Area	
	917.861	29.42	888.441	103.82	43.81	3	Hairline Fracture/Feature	Source Area	
	917.861	29.84	888.021	106.46	50.57	3	Hairline Fracture/Feature	Source Area	
	917.861	30.39	887.471	313.3	43.97	3	Hairline Fracture/Feature	Source Area	
	917.861	32.14	885.721	147.62	56.43	3	Hairline Fracture/Feature	Source Area	
	917.861	35.62	882.241	90.2	55.4	3	Hairline Fracture/Feature	Source Area	
	917.861	36.88	880.981	285.27	51.89	3	Hairline Fracture/Feature	Source Area	
	917.861	37.79	880.071	113.83	52.91	3	Fracture/Feature	Source Area	
	917.861	37.96	879.901	303.43	76.15	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	39.4	878.461	133.97	46.42	3	Fracture/Feature	Source Area	
	917.861	40.27	877.591	143.18	54.07	3	Fracture/Feature	Source Area	
	917.861	40.6	877.261	57.74	53.3	3	Hairline Fracture/Feature	Source Area	
	917.861	41.87	875.991	119.68	50.14	3	Bedding/Change in Lithology	Source Area	
	917.861	44.56	873.301	301.08	70.76	1	Fracture/Feature	Source Area	
	917.861	44.56	873.301	17.03	39.05	1	Fracture/Feature	Source Area	
	917.861	45.03	872.831	300.46	51.88	1	Fracture/Feature	Source Area	
	917.861	46.36	871.501	350.8	79.02	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	46.82	871.041	215.25	70.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	47.96	869.901	85.75	43.99	2	Hairline Fracture/Feature	Source Area	
	917.861	49.25	868.611	97.05	34.38	2	Bedding/Change in Lithology	Source Area	
	917.861	50.28	867.581	258.9	38.9	2	Hairline Fracture/Feature	Source Area	
	917.861	51.38	866.481	82.53	44.29	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	51.44	866.421	257.27	58.61	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	52.11	865.751	85.17	50.08	2	Hairline Fracture/Feature	Source Area	
	917.861	52.84	865.021	105.03	43.78	2	Bedding/Change in Lithology	Source Area	
	917.861	53.72	864.141	100.49	45.37	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	53.75	864.111	349.12	45.86	2	Bedding/Change in Lithology	Source Area	
	917.861	54.37	863.491	225.47	25.78	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	54.4	863.461	321.95	68.8	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	55.79	862.071	325.97	78.86	2	Hairline Fracture/Feature	Source Area	
	917.861	57.15	860.711	327.75	66.4	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	57.87	859.991	332.86	71.04	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	58.06	859.801	92.87	35.79	2	Hairline Fracture/Feature	Source Area	
	917.861	59.08	858.781	103.92	42.63	2	Hairline Fracture/Feature	Source Area	
	917.861	59.52	858.341	97.43	43.32	2	Hairline Fracture/Feature	Source Area	
	917.861	59.79	858.071	104.29	38.44	2	Hairline Fracture/Feature	Source Area	
	917.861	60.58	857.281	95.58	40.4	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	60.71	857.151	299.21	47.86	2	Hairline Fracture/Feature	Source Area	
	917.861	62.51	855.351	102.14	37.91	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	63.27	854.591	94.59	39.23	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	65.03	852.831	134.32	30.12	2	Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-5	917.861	65.36	852.501	100.54	37.52	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	65.87	851.991	82.36	50.1	2	Hairline Fracture/Feature	Source Area	
	917.861	67.02	850.841	219.25	86.43	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	68.2	849.661	265.14	54.84	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	68.79	849.071	89.53	43.87	2	Hairline Fracture/Feature	Source Area	
	917.861	69.33	848.531	102.82	48.56	2	Hairline Fracture/Feature	Source Area	
	917.861	70.24	847.621	126.5	33.6	2	Hairline Fracture/Feature	Source Area	
	917.861	71.51	846.351	315.87	70.89	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	72.02	845.841	250.73	35.21	1	Hairline Fracture/Feature	Source Area	
	917.861	72.24	845.621	250.97	29.24	1	Hairline Fracture/Feature	Source Area	
	917.861	74.26	843.601	299.38	43.71	2	Bedding/Change in Lithology	Source Area	
	917.861	75.44	842.421	273.3	63.66	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	77.84	840.021	85.67	46.91	2	Hairline Fracture/Feature	Source Area	
	917.861	78.17	839.691	255.38	67.84	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	78.76	839.101	247.16	67.58	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	79.35	838.511	267	67.1	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	80.21	837.651	230.19	57.28	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	80.65	837.211	92.28	45.88	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	81.63	836.231	287.14	54.63	2	Hairline Fracture/Feature	Source Area	
	917.861	82.37	835.491	91.08	45.45	2	Fracture/Feature	Source Area	
	917.861	83.11	834.751	94.9	44.43	2	Hairline Fracture/Feature	Source Area	
	917.861	83.87	833.991	97.97	44.84	2	Hairline Fracture/Feature	Source Area	
	917.861	84.41	833.451	278.93	67.49	2	Hairline Fracture/Feature	Source Area	
	917.861	88.26	829.601	102.34	44.71	2	Hairline Fracture/Feature	Source Area	
	917.861	89.51	828.351	95.57	33.68	2	Hairline Fracture/Feature	Source Area	
	917.861	89.79	828.071	107.56	46.08	2	Hairline Fracture/Feature	Source Area	
	917.861	90.09	827.771	94.56	51.15	2	Hairline Fracture/Feature	Source Area	
	917.861	90.49	827.371	114.61	46.17	2	Hairline Fracture/Feature	Source Area	
	917.861	90.7	827.161	259.63	63.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	92	825.861	237.77	57.2	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	92.79	825.071	103.22	38.83	2	Hairline Fracture/Feature	Source Area	
	917.861	93.44	824.421	111.53	46.25	2	Hairline Fracture/Feature	Source Area	
	917.861	94.12	823.741	269.11	75.88	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	96.75	821.111	97.35	43.99	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	97.52	820.341	82.64	53.55	2	Hairline Fracture/Feature	Source Area	
	917.861	97.86	820.001	95.13	40.89	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	98.62	819.241	115.59	43.95	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	99.63	818.231	93.87	64.16	2	Hairline Fracture/Feature	Source Area	
	917.861	101.12	816.741	133.58	58.76	2	Hairline Fracture/Feature	Source Area	
	917.861	101.62	816.241	106.4	48.98	2	Hairline Fracture/Feature	Source Area	
	917.861	101.93	815.931	113.55	53.36	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	102.41	815.451	132.4	70.23	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	103.19	814.671	102.44	35.78	2	Hairline Fracture/Feature	Source Area	
	917.861	104.23	813.631	85.77	53.26	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	104.67	813.191	113.08	43.9	2	Hairline Fracture/Feature	Source Area	
	917.861	105.46	812.401	115.14	58.08	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	106.38	811.481	111.26	60.02	1	Fracture/Feature	Source Area	
	917.861	112.9	804.961	156.04	56.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	114.11	803.751	81.42	39.81	1	Fracture/Feature	Source Area	
	917.861	114.59	803.271	94.07	43.12	3	Hairline Fracture/Feature	Source Area	
	917.861	115.25	802.611	113.58	42.06	3	Hairline Fracture/Feature	Source Area	
	917.861	116.67	801.191	111.66	55.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	119.3	798.561	143.14	34.29	3	Hairline Fracture/Feature	Source Area	
	917.861	123.12	794.741	139.91	59.08	3	Hairline Fracture/Feature	Source Area	
	917.861	124.47	793.391	104.52	49.59	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	125.81	792.051	153	44.27	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	126.03	791.831	131.7	46.12	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	126.69	791.171	150.89	48.79	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	127.2	790.661	153.34	72.82	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	127.48	790.381	149.18	79.14	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	131.81	786.051	165.98	51.33	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	135.99	781.871	4.12	63.02	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	142.96	774.901	137.4	55.69	2	Hairline Fracture/Feature	Source Area	
	917.861	147.16	770.701	161.96	26.93	3	Bedding/Change in Lithology	Source Area	
	917.861	156.08	761.781	167.85	40.39	3	Hairline Fracture/Feature	Source Area	
	917.861	157.01	760.851	114.03	40.4	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	157.51	760.351	129.65	35.6	3	Hairline Fracture/Feature	Source Area	
	917.861	157.93	759.931	118.42	38.94	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	158.78	759.081	123.7	42.65	3	Hairline Fracture/Feature	Source Area	
	917.861	160.93	756.931	107.81	44.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	162.31	755.551	123.38	46.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	163.42	754.441	185.4	25.25	2	Hairline Fracture/Feature	Source Area	
	917.861	172.11	745.751	136.92	68.18	2	Hairline Fracture/Feature	Source Area	
	917.861	181.05	736.811	134.32	59.09	2	Hairline Fracture/Feature	Source Area	
	917.861	183.79	734.071	109.91	61.16	3	Bedding/Change in Lithology	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-5	917.861	186.07	731.791	131.51	41.61	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	188.08	729.781	98.41	42.86	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	188.34	729.521	95.22	43.11	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	191.1	726.761	119.44	54.71	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	191.32	726.541	113.69	47.94	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	192.16	725.701	118.51	51.67	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	192.46	725.401	128.47	48.95	2	Hairline Fracture/Feature	Source Area	
	917.861	192.94	724.921	43.41	47.32	2	Hairline Fracture/Feature	Source Area	
	917.861	193.25	724.611	127.55	45.09	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	199.4	718.461	142.66	52.37	3	Bedding/Change in Lithology	Source Area	
	917.861	200.76	717.101	142.96	41	3	Bedding/Change in Lithology	Source Area	
	917.861	201.68	716.181	128.21	53.6	2	Bedding/Change in Lithology	Source Area	
	917.861	204.27	713.591	144.38	44.23	3	Bedding/Change in Lithology	Source Area	
	917.861	205.41	712.451	126.81	38.61	3	Bedding/Change in Lithology	Source Area	
	917.861	205.94	711.921	34.29	82.3	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	206.98	710.881	139.67	50.67	3	Bedding/Change in Lithology	Source Area	
	917.861	208.05	709.811	147.49	52.37	3	Hairline Fracture/Feature	Source Area	
	917.861	209.35	708.511	44.78	29.37	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	218.16	699.701	160.56	26.48	2	Bedding/Change in Lithology	Source Area	
	917.861	219.99	697.871	142.86	25.69	3	Bedding/Change in Lithology	Source Area	
	917.861	222.38	695.481	146.59	42.26	3	Hairline Fracture/Feature	Source Area	
	917.861	223.95	693.911	141.26	59.86	3	Bedding/Change in Lithology	Source Area	
	917.861	225.81	692.051	117.19	36.64	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	226.04	691.821	149.5	46.02	3	Bedding/Change in Lithology	Source Area	
	917.861	227.51	690.351	98.6	46.92	3	Bedding/Change in Lithology	Source Area	
	917.861	229.52	688.341	151.64	34.79	3	Bedding/Change in Lithology	Source Area	
	917.861	244.73	673.131	350.75	49.73	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	245.11	672.751	160.9	68.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	245.47	672.391	355.08	63.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	246.56	671.301	332.24	40.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	248.26	669.601	67.01	34.43	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	260.14	657.721	90.24	61.7	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	262.31	655.551	23.35	59.26	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	274.39	643.471	128.78	45.54	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	276.89	640.971	131.85	40.47	3	Hairline Fracture/Feature	Source Area	
	917.861	278.96	638.901	151.28	30.31	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	280.26	637.601	140.29	68.37	3	Hairline Fracture/Feature	Source Area	
	917.861	281.67	636.191	129.24	27.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	286.28	631.581	125.57	47.17	3	Bedding/Change in Lithology	Source Area	
	917.861	288.03	629.831	83.63	58.08	3	Bedding/Change in Lithology	Source Area	
	917.861	290.97	626.891	96.01	65.32	2	Hairline Fracture/Feature	Source Area	
	917.861	297.74	620.121	86.43	55.62	2	Hairline Fracture/Feature	Source Area	
	917.861	303.01	614.851	85.18	61.1	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	304.9	612.961	89.75	60.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	307.21	610.651	148.98	56.96	3	Hairline Fracture/Feature	Source Area	
	917.861	313.57	604.291	298	57.13	1	Fracture/Feature	Source Area	
	917.861	319.58	598.281	101.87	55.42	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	322.76	595.101	209.53	79.09	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	324.25	593.611	99.21	74.74	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	325.04	592.821	119.22	61.54	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	326.36	591.501	103.87	55.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	329.99	587.871	262.01	49.88	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	330.95	586.911	132.56	39.17	3	Hairline Fracture/Feature	Source Area	
	917.861	331.19	586.671	118.74	47.19	3	Bedding/Change in Lithology	Source Area	
	917.861	331.64	586.221	119.29	59.69	3	Bedding/Change in Lithology	Source Area	
	917.861	333.76	584.101	100.94	59.37	3	Hairline Fracture/Feature	Source Area	
	917.861	340.52	577.341	127.49	59.65	3	Hairline Fracture/Feature	Source Area	
	917.861	342.46	575.401	138.23	49.66	3	Hairline Fracture/Feature	Source Area	
	917.861	344.78	573.081	124.37	55.07	3	Bedding/Change in Lithology	Source Area	
	917.861	345.75	572.111	103.56	58.73	3	Bedding/Change in Lithology	Source Area	
	917.861	346.22	571.641	145.29	44.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	346.65	571.211	133.96	48.15	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	347.2	570.661	120.35	60.26	3	Hairline Fracture/Feature	Source Area	
	917.861	350.26	567.601	111.18	60.86	3	Hairline Fracture/Feature	Source Area	
	917.861	354.19	563.671	110.5	56.02	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	354.5	563.361	110.91	52.73	3	Hairline Fracture/Feature	Source Area	
	917.861	355.49	562.371	115.7	55.49	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	358.86	559.001	160.6	33.92	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	361.08	556.781	119.71	51.28	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	362.53	555.331	115.89	40.69	2	Bedding/Change in Lithology	Source Area	
	917.861	363.1	554.761	326.18	43.72	1	Hairline Fracture/Feature	Source Area	
	917.861	363.25	554.611	155.15	54.69	2	Bedding/Change in Lithology	Source Area	
	917.861	364.17	553.691	113.63	52.99	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	371.72	546.141	156.58	30.19	3	Bedding/Change in Lithology	Source Area	
	917.861	375.33	542.531	115.94	47.27	3	Bedding/Change in Lithology	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-5	917.861	376.65	541.211	349.97	25.04	1	Hairline Fracture/Feature	Source Area	
	917.861	377.6	540.261	113.83	57.46	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	378.73	539.131	201.77	46.01	2	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	383.38	534.481	139.1	38.2	3	Discontinuous Hairline Fracture/Feature	Source Area	
	917.861	388.55	529.311	16.34	27.05	1	Hairline Fracture/Feature	Source Area	
	917.861	390.07	527.791	141.44	36.72	2	Hairline Fracture/Feature	Source Area	
	917.861	395.51	522.351	137.14	42.19	3	Hairline Fracture/Feature	Source Area	
	917.861	396.69	521.171	164.7	32.42	3	Hairline Fracture/Feature	Source Area	
MLS-6	918.951	29.28	889.671	159.05	37.29	3	Hairline Fracture/Feature	Source Area	
	918.951	31.28	887.671	125.25	65.84	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	32.76	886.191	166.25	40.06	3	Hairline Fracture/Feature	Source Area	
	918.951	36.02	882.931	152.84	49.78	2	Hairline Fracture/Feature	Source Area	
	918.951	36.79	882.161	147.85	69.88	2	Hairline Fracture/Feature	Source Area	
	918.951	39.64	879.311	277.93	65.38	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	39.85	879.101	136.69	56.36	2	Hairline Fracture/Feature	Source Area	
	918.951	40.95	878.001	164.38	45.42	2	Bedding/Change in Lithology	Source Area	
	918.951	43.35	875.601	166.16	42.84	2	Bedding/Change in Lithology	Source Area	
	918.951	45.99	872.961	321.48	52.92	2	Bedding/Change in Lithology	Source Area	
	918.951	49.62	869.331	152.04	44.73	2	Bedding/Change in Lithology	Source Area	
	918.951	51.76	867.191	126.72	40.56	2	Hairline Fracture/Feature	Source Area	
	918.951	52.56	866.391	262.69	62.2	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	52.97	865.981	249.05	64.28	2	Hairline Fracture/Feature	Source Area	
	918.951	53.57	865.381	255.34	56.94	2	Hairline Fracture/Feature	Source Area	
	918.951	53.61	865.341	25.55	57.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	54.28	864.671	128.58	46.41	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	55.03	863.921	15.4	55.07	2	Bedding/Change in Lithology	Source Area	
	918.951	55.9	863.051	245.66	67.08	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	60.48	858.471	297.37	37.39	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	61.73	857.221	150.34	38.41	2	Bedding/Change in Lithology	Source Area	
	918.951	65.11	853.841	352.22	59.94	3	Bedding/Change in Lithology	Source Area	
	918.951	65.83	853.121	4.86	57.3	3	Bedding/Change in Lithology	Source Area	
	918.951	66.93	852.021	7.36	60.96	3	Bedding/Change in Lithology	Source Area	
	918.951	68.96	849.991	263.91	43.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	70.18	848.771	175.69	38.16	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	71.98	846.971	260.47	72.83	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	74.79	844.161	161.11	46.68	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	76.6	842.351	106.57	49.62	3	Hairline Fracture/Feature	Source Area	
	918.951	80.75	838.201	241.54	41.36	3	Hairline Fracture/Feature	Source Area	
	918.951	80.94	838.011	121.33	43.2	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	82.64	836.311	1.86	42.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	84.28	834.671	347.82	79.75	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	84.68	834.271	158.66	46.64	2	Hairline Fracture/Feature	Source Area	
	918.951	90.93	828.021	268.02	65.98	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	91.39	827.561	20.86	47.02	2	Hairline Fracture/Feature	Source Area	
	918.951	92.85	826.101	136.06	46.77	2	Hairline Fracture/Feature	Source Area	
	918.951	92.91	826.041	330.5	33.18	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	93.27	825.681	125.69	30.69	2	Hairline Fracture/Feature	Source Area	
	918.951	98.68	820.271	11.76	26.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	99.04	819.911	267.58	69.7	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	100.36	818.591	331.47	28.85	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	101.58	817.371	337.75	32.74	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	102.08	816.871	169.12	45.02	2	Hairline Fracture/Feature	Source Area	
	918.951	103.58	815.371	118.58	61.83	2	Fracture/Feature	Source Area	
	918.951	104.78	814.171	119.39	41.36	2	Hairline Fracture/Feature	Source Area	
	918.951	106.22	812.731	130.04	43.56	2	Hairline Fracture/Feature	Source Area	
	918.951	109.11	809.841	123.31	45.52	2	Hairline Fracture/Feature	Source Area	
	918.951	109.93	809.021	137.7	47.4	2	Bedding/Change in Lithology	Source Area	
	918.951	111.46	807.491	315.03	32.62	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	111.66	807.291	131.55	53.18	2	Hairline Fracture/Feature	Source Area	
	918.951	113.32	805.631	308.02	29.05	2	Hairline Fracture/Feature	Source Area	
	918.951	115.31	803.641	10.36	45.81	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	115.65	803.301	143.99	55.32	2	Bedding/Change in Lithology	Source Area	
	918.951	116.84	802.111	143.8	53.85	2	Hairline Fracture/Feature	Source Area	
	918.951	119.4	799.551	141.21	59.84	3	Hairline Fracture/Feature	Source Area	
	918.951	120.28	798.671	149.45	65.07	3	Hairline Fracture/Feature	Source Area	
	918.951	121.51	797.441	150.98	52.08	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	122.22	796.731	141.77	48.69	2	Hairline Fracture/Feature	Source Area	
	918.951	125.02	793.931	52.24	38.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	125.47	793.481	195.35	31.08	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	126.83	792.121	178.3	53.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	128.7	790.251	154.29	50.43	3	Bedding/Change in Lithology	Source Area	
	918.951	129.6	789.351	160.22	69.24	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	129.64	789.311	348.27	48.56	3	Fracture/Feature	Source Area	
	918.951	131.88	787.071	47.98	76.72	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	133.68	785.271	150.98	62.28	3	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
	918.951	135.11	783.841	285.32	76.88	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	135.43	783.521	124.83	45.44	3	Bedding/Change in Lithology	Source Area	
	918.951	136.02	782.931	135.49	61.7	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	139.99	778.961	138.06	58.39	3	Hairline Fracture/Feature	Source Area	
	918.951	140.92	778.031	135.83	55.8	3	Hairline Fracture/Feature	Source Area	
	918.951	142.28	776.671	7	22.86	2	Hairline Fracture/Feature	Source Area	
	918.951	143.87	775.081	207.67	26.7	3	Hairline Fracture/Feature	Source Area	
	918.951	146.3	772.651	131.63	56.69	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	150.58	768.371	3.46	56.07	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	151.9	767.051	121.95	58.56	3	Hairline Fracture/Feature	Source Area	
	918.951	154.22	764.731	110.2	44.9	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	157.03	761.921	114.83	57.19	3	Hairline Fracture/Feature	Source Area	
	918.951	158.35	760.601	131.45	49.25	3	Hairline Fracture/Feature	Source Area	
	918.951	158.89	760.061	141.28	46.42	3	Hairline Fracture/Feature	Source Area	
	918.951	159.45	759.501	124.14	47.61	3	Hairline Fracture/Feature	Source Area	
	918.951	160.12	758.831	46.73	68.15	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	161.36	757.591	281.94	57.19	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	161.82	757.131	136.14	58.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	164.65	754.301	25.64	51.09	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	165.17	753.781	29.44	55.63	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	166	752.951	125.49	54.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	167.33	751.621	150.19	58.41	2	Hairline Fracture/Feature	Source Area	
	918.951	168.3	750.651	178.32	52.93	3	Bedding/Change in Lithology	Source Area	
	918.951	168.77	750.181	164.3	56.04	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	169.46	749.491	185.6	49.55	3	Bedding/Change in Lithology	Source Area	
	918.951	170.9	748.051	333.22	30.51	2	Hairline Fracture/Feature	Source Area	
	918.951	177.92	741.031	113.66	47.2	2	Hairline Fracture/Feature	Source Area	
	918.951	178.75	740.201	102.7	54.56	2	Hairline Fracture/Feature	Source Area	
	918.951	182.35	736.601	351.51	64.81	3	Hairline Fracture/Feature	Source Area	
	918.951	182.81	736.141	352.58	62.3	3	Hairline Fracture/Feature	Source Area	
	918.951	183.15	735.801	2.29	56.91	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	183.69	735.261	357.49	63.11	3	Hairline Fracture/Feature	Source Area	
	918.951	187.98	730.971	139.85	50.19	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	189.31	729.641	9.85	74.62	2	Hairline Fracture/Feature	Source Area	
	918.951	189.94	729.011	148.7	37.48	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	190.38	728.571	159.15	54.49	2	Hairline Fracture/Feature	Source Area	
	918.951	191.29	727.661	167.01	49.29	2	Hairline Fracture/Feature	Source Area	
MLS-6	918.951	193.96	724.991	179.32	37.12	3	Hairline Fracture/Feature	Source Area	
	918.951	195.4	723.551	142.6	68.27	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	196.87	722.081	153.7	59.15	3	Bedding/Change in Lithology	Source Area	
	918.951	198.28	720.671	341.47	59.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	198.92	720.031	172.68	40.86	3	Hairline Fracture/Feature	Source Area	
	918.951	199.25	719.701	160.6	47.77	3	Hairline Fracture/Feature	Source Area	
	918.951	200.14	718.811	117.99	35.57	3	Hairline Fracture/Feature	Source Area	
	918.951	202.2	716.751	110.32	30.67	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	203.77	715.181	118.08	26.22	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	205.66	713.291	177.65	48.84	2	Bedding/Change in Lithology	Source Area	
	918.951	206.65	712.301	257.66	58.29	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	207.79	711.161	138.07	73.26	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	209.9	709.051	134.15	32.85	2	Hairline Fracture/Feature	Source Area	
	918.951	210.04	708.911	342.35	57.38	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	212.52	706.431	162.69	54.88	2	Hairline Fracture/Feature	Source Area	
	918.951	213.17	705.781	164.02	56.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	214.29	704.661	126.67	76.91	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	214.55	704.401	50.31	64.75	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	216.23	702.721	146.73	51.16	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	216.48	702.471	272.58	63.53	3	Hairline Fracture/Feature	Source Area	
	918.951	217.25	701.701	269.76	62.64	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	218.53	700.421	13.26	53.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	221.6	697.351	336.99	61.63	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	221.63	697.321	246.2	68.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	222.74	696.211	150.54	48.06	3	Bedding/Change in Lithology	Source Area	
	918.951	223.26	695.691	246.05	74.49	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	224.94	694.011	214.54	63.88	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	228.44	690.511	263.76	78.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	228.82	690.131	185.87	38.79	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	229.77	689.181	139.62	58.16	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	229.89	689.061	218.52	77.8	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	230.55	688.401	125.39	58.04	2	Bedding/Change in Lithology	Source Area	
	918.951	232.06	686.891	270.86	58.04	2	Hairline Fracture/Feature	Source Area	
	918.951	233.66	685.291	357	59.04	2	Hairline Fracture/Feature	Source Area	
	918.951	235.12	683.831	112.5	70.44	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	236.76	682.191	146.36	43.31	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	239.3	679.651	356.5	65.4	2	Hairline Fracture/Feature	Source Area	
	918.951	245.31	673.641	176.48	61.92	3	Discontinuous Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-6	918.951	248.82	670.131	128.44	59.57	2	Hairline Fracture/Feature	Source Area	
	918.951	249.67	669.281	125.45	57.89	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	250.2	668.751	120.43	55.68	2	Bedding/Change in Lithology	Source Area	
	918.951	251.78	667.171	146.33	65.24	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	254.65	664.301	167.8	57.46	2	Hairline Fracture/Feature	Source Area	
	918.951	257.58	661.371	227.83	72.11	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	264.65	654.301	175.55	47.43	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	267.9	651.051	172.55	35.68	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	269.1	649.851	123.28	43.95	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	271.36	647.591	178.18	29.97	3	Bedding/Change in Lithology	Source Area	
	918.951	274.71	644.241	169.26	44.51	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	276.35	642.601	300.39	50.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	279.23	639.721	169.47	31.92	2	Hairline Fracture/Feature	Source Area	
	918.951	279.7	639.251	164.24	24.8	3	Bedding/Change in Lithology	Source Area	
	918.951	284.33	634.621	122.77	60.85	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	286.23	632.721	118.99	55.39	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	286.51	632.441	119.63	55.38	2	Hairline Fracture/Feature	Source Area	
	918.951	290.1	628.851	261.68	58.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	290.66	628.291	127.99	36.62	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	296.62	622.331	129.19	33.11	3	Hairline Fracture/Feature	Source Area	
	918.951	297.13	621.821	301.33	50.46	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	297.45	621.501	300.22	49.59	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	298.32	620.631	270.94	59.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	298.44	620.511	110.25	24.08	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	300.1	618.851	116.69	27.94	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	300.43	618.521	138.24	33.28	3	Hairline Fracture/Feature	Source Area	
	918.951	300.98	617.971	327.36	29.88	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	302	616.951	123.18	40.26	3	Hairline Fracture/Feature	Source Area	
	918.951	302.65	616.301	119.76	37.25	3	Hairline Fracture/Feature	Source Area	
	918.951	303.3	615.651	92.85	37.52	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	303.62	615.331	247.86	64.91	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	305.66	613.291	313.4	44.11	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	306.72	612.231	154.18	37.07	3	Bedding/Change in Lithology	Source Area	
	918.951	307.38	611.571	258.87	74.95	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	308.08	610.871	120.93	51.53	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	308.76	610.191	273.73	45.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	309.43	609.521	352	49.78	3	Bedding/Change in Lithology	Source Area	
	918.951	309.95	609.001	39.05	48.02	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	311.56	607.391	137.12	60.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	312.83	606.121	98.44	63.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	313.12	605.831	109.68	47.3	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	313.66	605.291	128.61	51.62	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	316.7	602.251	125.46	75.24	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	320.04	598.911	255.77	70.19	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	320.23	598.721	131.97	67.83	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	320.99	597.961	254.49	76.25	2	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	322.28	596.671	141.12	42.65	2	Bedding/Change in Lithology	Source Area	
	918.951	323.7	595.251	141.35	48.96	2	Bedding/Change in Lithology	Source Area	
	918.951	325.12	593.831	78.21	50.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	326.34	592.611	100.66	38.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	331.3	587.651	138.36	46.48	3	Discontinuous Hairline Fracture/Feature	Source Area	
	918.951	336.04	582.911	326.86	67.52	1	Fracture/Feature	Source Area	
MLS-7	901.731	22.61	879.121	117.7	46.65	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	23.65	878.081	134.58	48.18	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	23.89	877.841	117.69	45.4	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	28.52	873.211	98.61	52.26	3	Hairline Fracture/Feature	Source Area	
	901.731	37.93	863.801	223.43	78.19	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	38.48	863.251	96.75	54.08	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	40.94	860.791	219.03	79.35	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	45.16	856.571	285.27	71.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	45.75	855.981	282.33	62.8	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	47.96	853.771	147.76	52.25	1	Hairline Fracture/Feature	Source Area	
	901.731	48.14	853.591	268.21	65.7	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	48.8	852.931	106.11	56.41	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	49.09	852.641	108.32	50.39	2	Hairline Fracture/Feature	Source Area	
	901.731	49.69	852.041	132.9	67.32	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	50.13	851.601	277.05	63.05	2	Hairline Fracture/Feature	Source Area	
	901.731	50.53	851.201	281.45	47.25	2	Hairline Fracture/Feature	Source Area	
	901.731	51	850.731	271.34	54.87	2	Hairline Fracture/Feature	Source Area	
	901.731	52.07	849.661	288.06	56.74	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	52.27	849.461	269.1	55.62	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	52.77	848.961	273.32	52.22	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	53.24	848.491	269.78	61.23	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	53.64	848.091	189.73	53.82	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	56.43	845.301	297.13	37.95	2	Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-7	901.731	56.94	844.791	264.87	34.56	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	57.37	844.361	282.36	61.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	57.8	843.931	252.81	58.11	3	Hairline Fracture/Feature	Source Area	
	901.731	58.44	843.291	262.51	64.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	59.41	842.321	210.37	73.22	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	60.87	840.861	81.2	58.54	3	Hairline Fracture/Feature	Source Area	
	901.731	61.36	840.371	229.5	57.53	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	63.24	838.491	131.93	56.05	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	63.49	838.241	95.04	32.5	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	66.97	834.761	221.17	67.98	2	Hairline Fracture/Feature	Source Area	
	901.731	69.09	832.641	75.68	54.44	2	Hairline Fracture/Feature	Source Area	
	901.731	70.86	830.871	279.16	60.59	2	Hairline Fracture/Feature	Source Area	
	901.731	72.22	829.511	296.17	23.67	1	Hairline Fracture/Feature	Source Area	
	901.731	72.62	829.111	198.93	59.98	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	72.88	828.851	89.2	56.26	2	Hairline Fracture/Feature	Source Area	
	901.731	73.26	828.471	81.34	49.66	2	Hairline Fracture/Feature	Source Area	
	901.731	73.88	827.851	71.95	53.23	2	Hairline Fracture/Feature	Source Area	
	901.731	74.15	827.581	210.99	71.9	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	74.81	826.921	85.94	56.26	2	Hairline Fracture/Feature	Source Area	
	901.731	75.96	825.771	112.13	75.73	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	76.11	825.621	194.46	64.92	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	76.23	825.501	260.4	72.14	2	Fracture/Feature	Source Area	
	901.731	78.28	823.451	93.76	54.79	2	Hairline Fracture/Feature	Source Area	
	901.731	78.66	823.071	194.35	62.45	2	Hairline Fracture/Feature	Source Area	
	901.731	78.85	822.881	196.46	65.87	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	79.01	822.721	94.7	52.84	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	79.27	822.461	96.09	53.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	82.55	819.181	156.58	48.46	2	Hairline Fracture/Feature	Source Area	
	901.731	82.69	819.041	138.72	28.15	2	Hairline Fracture/Feature	Source Area	
	901.731	83.8	817.931	87.59	54.31	2	Hairline Fracture/Feature	Source Area	
	901.731	83.97	817.761	157.34	52.63	2	Hairline Fracture/Feature	Source Area	
	901.731	84.55	817.181	159.68	55.52	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	85.66	816.071	96.88	45.46	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	86.04	815.691	104.53	50.92	2	Hairline Fracture/Feature	Source Area	
	901.731	87.38	814.351	129.54	56.43	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	88.72	813.011	121.89	45.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	91.32	810.411	103.86	61.06	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	94.99	806.741	209.76	73.22	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	99.92	801.811	124.47	50.46	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	99.94	801.791	320.67	40.11	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	101.19	800.541	104.99	57.04	3	Hairline Fracture/Feature	Source Area	
	901.731	108.36	793.371	230.96	75.54	1	Fracture/Feature	Source Area	
	901.731	108.64	793.091	222.39	62.01	2	Hairline Fracture/Feature	Source Area	
	901.731	111.34	790.391	96.04	47.79	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	112.19	789.541	29.17	36.88	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	112.91	788.821	79.94	57.09	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	114.08	787.651	103.49	27.95	1	Fracture/Feature	Source Area	
	901.731	114.76	786.971	117.28	59.12	2	Bedding/Change in Lithology	Source Area	
	901.731	115.17	786.561	108.77	57.31	2	Hairline Fracture/Feature	Source Area	
	901.731	115.74	785.991	112.7	70.25	2	Hairline Fracture/Feature	Source Area	
	901.731	117.04	784.691	128.26	49.34	2	Hairline Fracture/Feature	Source Area	
	901.731	121.08	780.651	118.58	51.3	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	124.42	777.311	122.95	50.26	2	Bedding/Change in Lithology	Source Area	
	901.731	125.2	776.531	122.57	48.56	2	Bedding/Change in Lithology	Source Area	
	901.731	130.15	771.581	147.87	60.9	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	130.48	771.251	148.89	59.99	3	Bedding/Change in Lithology	Source Area	
	901.731	131.03	770.701	140.32	58.22	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	131.69	770.041	132.71	60.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	135.74	765.991	156.34	43.34	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	135.94	765.791	237.65	74.79	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	152.22	749.511	213.9	63.65	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	152.41	749.321	111.93	40.9	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	152.5	749.231	252.14	70.52	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	152.77	748.961	125.34	42.93	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	161.09	740.641	133.59	76.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	171.44	730.291	97.64	52.75	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	175.24	726.491	141.9	49.9	3	Hairline Fracture/Feature	Source Area	
	901.731	179.88	721.851	247.28	74.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	182.15	719.581	104.61	21.49	3	Hairline Fracture/Feature	Source Area	
	901.731	190.79	710.941	102.47	59.87	2	Bedding/Change in Lithology	Source Area	
	901.731	191.21	710.521	103.76	56.41	2	Hairline Fracture/Feature	Source Area	
	901.731	191.69	710.041	105.48	53.96	2	Hairline Fracture/Feature	Source Area	
	901.731	195.18	706.551	167.91	53.48	3	Hairline Fracture/Feature	Source Area	
	901.731	197.44	704.291	119.93	47.69	3	Hairline Fracture/Feature	Source Area	
	901.731	201.1	700.631	144.14	36.32	3	Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-7	901.731	201.85	699.881	107.78	47.99	3	Hairline Fracture/Feature	Source Area	
	901.731	207.86	693.871	186.69	19.69	2	Hairline Fracture/Feature	Source Area	
	901.731	224.61	677.121	355.27	38.08	3	Hairline Fracture/Feature	Source Area	
	901.731	231.02	670.711	163.83	35.54	3	Hairline Fracture/Feature	Source Area	
	901.731	237.05	664.681	113.84	46.68	2	Hairline Fracture/Feature	Source Area	
	901.731	237.65	664.081	138.93	64.32	2	Hairline Fracture/Feature	Source Area	
	901.731	244.66	657.071	134.77	32.83	3	Bedding/Change in Lithology	Source Area	
	901.731	253.62	648.111	302.06	83.83	2	Hairline Fracture/Feature	Source Area	
	901.731	253.84	647.891	289.45	78.24	2	Hairline Fracture/Feature	Source Area	
	901.731	254.85	646.881	304.28	58.09	2	Hairline Fracture/Feature	Source Area	
	901.731	257.5	644.231	277.6	70.48	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	275.58	626.151	143.67	25.81	2	Hairline Fracture/Feature	Source Area	
	901.731	285.18	616.551	151.64	29.66	3	Hairline Fracture/Feature	Source Area	
	901.731	299.03	602.701	334.91	47.24	2	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	300.53	601.201	162.89	32.93	2	Hairline Fracture/Feature	Source Area	
	901.731	301.51	600.221	156.54	42.12	2	Hairline Fracture/Feature	Source Area	
	901.731	302.02	599.711	99.64	72.04	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	304.55	597.181	156.35	35.43	2	Hairline Fracture/Feature	Source Area	
	901.731	306.56	595.171	45.4	75.14	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	309.77	591.961	264.34	65.71	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	312.8	588.931	155.44	41.56	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	316.04	585.691	13.35	34.69	2	Hairline Fracture/Feature	Source Area	
	901.731	318.39	583.341	147.92	40.35	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	320.38	581.351	151.47	61.88	2	Hairline Fracture/Feature	Source Area	
	901.731	324.9	576.831	136.34	20.95	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	336.56	565.171	149.31	47.91	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	344.28	557.451	105.07	48.92	2	Hairline Fracture/Feature	Source Area	
	901.731	352.54	549.191	260.41	44.24	2	Hairline Fracture/Feature	Source Area	
	901.731	357.22	544.511	166.24	33.96	2	Hairline Fracture/Feature	Source Area	
	901.731	361.47	540.261	269.3	60.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	365.15	536.581	279.93	59.64	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	365.71	536.021	151.56	42.74	2	Hairline Fracture/Feature	Source Area	
	901.731	384.93	516.801	260.65	32.81	2	Hairline Fracture/Feature	Source Area	
	901.731	385.43	516.301	266.68	26.63	2	Hairline Fracture/Feature	Source Area	
	901.731	386.72	515.011	307.4	65.13	1	Fracture/Feature	Source Area	
	901.731	388.11	513.621	287.78	39	2	Hairline Fracture/Feature	Source Area	
	901.731	389.15	512.581	252.1	28.84	2	Hairline Fracture/Feature	Source Area	
	901.731	389.59	512.141	202.78	21.09	2	Hairline Fracture/Feature	Source Area	
	901.731	390.22	511.511	159.24	42.21	2	Hairline Fracture/Feature	Source Area	
	901.731	396	505.731	111.54	58.81	3	Discontinuous Hairline Fracture/Feature	Source Area	
	901.731	396.85	504.881	121.41	40.51	3	Hairline Fracture/Feature	Source Area	
MLS-8	850.248	28.7	821.548	174.22	55.44	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	33.28	816.968	151.36	41.56	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	34.89	815.358	129.23	72.11	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	34.97	815.278	281.9	42.45	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	37.55	812.698	133.04	51.13	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	39.03	811.218	153.99	43.64	2	Bedding/Change in Lithology	Residential Area	
	850.248	41.24	809.008	287.97	55.1	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	41.54	808.708	132.99	54.5	2	Hairline Fracture/Feature	Residential Area	
	850.248	42.04	808.208	140.15	57.33	2	Bedding/Change in Lithology	Residential Area	
	850.248	42.82	807.428	137.13	59.78	2	Hairline Fracture/Feature	Residential Area	
	850.248	44.15	806.098	214.54	63.06	2	Hairline Fracture/Feature	Residential Area	
	850.248	46.89	803.358	159.24	44.56	2	Hairline Fracture/Feature	Residential Area	
	850.248	49.99	800.258	149.98	43.91	2	Hairline Fracture/Feature	Residential Area	
	850.248	55.35	794.898	216.31	76.89	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	56.47	793.778	276.7	52.37	2	Hairline Fracture/Feature	Residential Area	
	850.248	60.72	789.528	150.01	58.88	2	Bedding/Change in Lithology	Residential Area	
	850.248	61.55	788.698	21.95	82.53	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	62.34	787.908	143.79	57.27	2	Bedding/Change in Lithology	Residential Area	
	850.248	63.95	786.298	282.29	40.54	2	Bedding/Change in Lithology	Residential Area	
	850.248	66.86	783.388	148.88	45.94	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	67.44	782.808	238.03	52.07	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	71.92	778.328	88.66	44.42	2	Bedding/Change in Lithology	Residential Area	
	850.248	72.82	777.428	148.77	71	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	74.32	775.928	213.39	72.37	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	74.64	775.608	297.78	33.64	2	Bedding/Change in Lithology	Residential Area	
	850.248	75.67	774.578	180.57	54.26	2	Hairline Fracture/Feature	Residential Area	
	850.248	76.87	773.378	308.3	32.51	2	Bedding/Change in Lithology	Residential Area	
	850.248	78.08	772.168	146.13	70.64	2	Hairline Fracture/Feature	Residential Area	
	850.248	79.36	770.888	308.46	28.67	2	Hairline Fracture/Feature	Residential Area	
	850.248	80.38	769.868	281.21	25.9	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	81.24	769.008	215.38	59.4	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	82.94	767.308	174.48	40.5	2	Hairline Fracture/Feature	Residential Area	
	850.248	87.01	763.238	323.36	39.89	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	88.12	762.128	268.08	42.17	2	Discontinuous Hairline Fracture/Feature	Residential Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-8	850.248	89.74	760.508	147.4	55.89	2	Hairline Fracture/Feature	Residential Area	
	850.248	90.98	759.268	164.25	62.37	2	Hairline Fracture/Feature	Residential Area	
	850.248	91.77	758.478	122.69	56.32	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	93.53	756.718	308.88	52.01	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	94.63	755.618	291.68	53.46	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	97.52	752.728	156.61	61.85	2	Hairline Fracture/Feature	Residential Area	
	850.248	98.62	751.628	318.35	58.21	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	99.55	750.698	289.7	75.17	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	100.65	749.598	152.04	60.28	2	Hairline Fracture/Feature	Residential Area	
	850.248	108.54	741.708	150.73	61.83	2	Hairline Fracture/Feature	Residential Area	
	850.248	109.23	741.018	154.9	52.11	2	Fracture/Feature	Residential Area	
	850.248	112.66	737.588	330.15	35.93	3	Hairline Fracture/Feature	Residential Area	
	850.248	114.78	735.468	208.88	21.83	2	Bedding/Change in Lithology	Residential Area	
	850.248	115.78	734.468	309.62	51.72	2	Hairline Fracture/Feature	Residential Area	
	850.248	118.9	731.348	134.47	47.16	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	121.38	728.868	255.47	25.61	3	Bedding/Change in Lithology	Residential Area	
	850.248	122.57	727.678	291.75	51.45	3	Hairline Fracture/Feature	Residential Area	
	850.248	123.39	726.858	296.36	46.45	3	Hairline Fracture/Feature	Residential Area	
	850.248	128.73	721.518	179.74	26.04	2	Bedding/Change in Lithology	Residential Area	
	850.248	134.32	715.928	318.33	44.65	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	137.44	712.808	341.31	65.91	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	138.96	711.288	304.44	60.12	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	144.52	705.728	136.12	45.64	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	145.41	704.838	308.72	41.73	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	148.94	701.308	144.48	38.55	3	Bedding/Change in Lithology	Residential Area	
	850.248	152.47	697.778	188.4	60.73	3	Bedding/Change in Lithology	Residential Area	
	850.248	153.34	696.908	312.05	80.56	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	157.08	693.168	301.69	57.72	2	Hairline Fracture/Feature	Residential Area	
	850.248	158.26	691.988	159.43	14.63	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	159.38	690.868	299.06	39.82	3	Bedding/Change in Lithology	Residential Area	
	850.248	162.03	688.218	341.61	61	2	Fracture/Feature	Residential Area	
	850.248	164.31	685.938	49.69	21.65	3	Bedding/Change in Lithology	Residential Area	
	850.248	167.49	682.758	265.63	44.27	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	169.27	680.978	149.18	62.7	2	Hairline Fracture/Feature	Residential Area	
	850.248	170.49	679.758	319.67	53.34	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	179.9	670.348	147.5	58.65	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	179.96	670.288	337.6	24.41	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	181.57	668.678	317.96	50.86	2	Hairline Fracture/Feature	Residential Area	
	850.248	181.79	668.458	310.56	40.85	2	Hairline Fracture/Feature	Residential Area	
	850.248	186.86	663.388	279.97	25.33	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	194.68	655.568	155.44	45.83	2	Hairline Fracture/Feature	Residential Area	
	850.248	199.96	650.288	141.08	37.67	3	Bedding/Change in Lithology	Residential Area	
	850.248	205.87	644.378	158.54	31.64	2	Hairline Fracture/Feature	Residential Area	
	850.248	207.69	642.558	150.31	43.1	2	Hairline Fracture/Feature	Residential Area	
	850.248	208.71	641.538	290.14	68.2	2	Hairline Fracture/Feature	Residential Area	
	850.248	209.18	641.068	293.15	48.74	2	Hairline Fracture/Feature	Residential Area	
	850.248	209.98	640.268	281.7	54.57	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	211.6	638.648	147.52	44.88	2	Hairline Fracture/Feature	Residential Area	
	850.248	215.1	635.148	104.44	50.95	3	Bedding/Change in Lithology	Residential Area	
	850.248	218.3	631.948	315.4	56.42	2	Hairline Fracture/Feature	Residential Area	
	850.248	219.28	630.968	139.25	65.4	2	Hairline Fracture/Feature	Residential Area	
	850.248	222.75	627.498	148.89	38.05	3	Bedding/Change in Lithology	Residential Area	
	850.248	224.81	625.438	145.26	44.78	3	Bedding/Change in Lithology	Residential Area	
	850.248	227.85	622.398	331.34	75.81	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	229.95	620.298	301.77	81.02	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	230.99	619.258	158.14	40.51	2	Bedding/Change in Lithology	Residential Area	
	850.248	238	612.248	295.01	51.68	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	240.31	609.938	163.91	41.31	2	Bedding/Change in Lithology	Residential Area	
	850.248	243.89	606.358	165.86	38.03	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	244.48	605.768	268.34	41.92	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	246.81	603.438	318.07	56.69	2	Hairline Fracture/Feature	Residential Area	
	850.248	249.64	600.608	157.57	59.25	3	Bedding/Change in Lithology	Residential Area	
	850.248	256.46	593.788	314.42	78.58	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	273.27	576.978	151.62	81.99	1	Fracture/Feature	Residential Area	
	850.248	275.2	575.048	109.92	64.05	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	284.94	565.308	136.85	74.38	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	286.05	564.198	349.62	45.81	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	289.07	561.178	125.7	46.75	1	Fracture/Feature	Residential Area	
	850.248	293.64	556.608	141.78	32.25	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	850.248	294.2	556.048	140.67	66.34	3	Hairline Fracture/Feature	Residential Area	
MLS-9	789.738	55.34	734.398	131.66	74.24	1	Fracture/Feature	Residential Area	
	789.738	56.39	733.348	121.09	37.79	2	Hairline Fracture/Feature	Residential Area	
	789.738	57.18	732.558	180.66	76.2	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	59.26	730.478	89.73	39.24	2	Hairline Fracture/Feature	Residential Area	
	789.738	59.27	730.468	193.68	72.67	2	Discontinuous Hairline Fracture/Feature	Residential Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-9	789.738	60.29	729.448	159.3	22.51	2	Hairline Fracture/Feature	Residential Area	
	789.738	60.55	729.188	112.4	33.08	2	Hairline Fracture/Feature	Residential Area	
	789.738	60.88	728.858	120.07	15.96	2	Hairline Fracture/Feature	Residential Area	
	789.738	61.8	727.938	133.6	15.07	2	Hairline Fracture/Feature	Residential Area	
	789.738	62.05	727.688	130.1	28.65	2	Hairline Fracture/Feature	Residential Area	
	789.738	65.02	724.718	239.48	25.66	3	Hairline Fracture/Feature	Residential Area	
	789.738	66.41	723.328	316.77	64.36	2	Hairline Fracture/Feature	Residential Area	
	789.738	67.21	722.528	276.36	46.56	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	68.72	721.018	228.85	17.46	2	Hairline Fracture/Feature	Residential Area	
	789.738	70.63	719.108	127.68	28.84	3	Hairline Fracture/Feature	Residential Area	
	789.738	78.12	711.618	93.94	42.28	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	81.99	707.748	253.85	45.5	2	Hairline Fracture/Feature	Residential Area	
	789.738	83.94	705.798	308.78	24.51	2	Hairline Fracture/Feature	Residential Area	
	789.738	85.13	704.608	319.02	38.39	2	Hairline Fracture/Feature	Residential Area	
	789.738	85.46	704.278	317.53	38.24	2	Hairline Fracture/Feature	Residential Area	
	789.738	85.69	704.048	289.78	70.37	2	Hairline Fracture/Feature	Residential Area	
	789.738	85.76	703.978	314.23	40.94	2	Hairline Fracture/Feature	Residential Area	
	789.738	87.93	701.808	102.21	23.97	2	Hairline Fracture/Feature	Residential Area	
	789.738	89.06	700.678	274.2	35.43	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	91.83	697.908	288.98	33.13	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	92.34	697.398	297.5	39.25	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	95.28	694.458	121.59	33.1	3	Hairline Fracture/Feature	Residential Area	
	789.738	100.56	689.178	116.74	62.44	3	Hairline Fracture/Feature	Residential Area	
	789.738	102.75	686.988	273.11	32.56	2	Hairline Fracture/Feature	Residential Area	
	789.738	108.27	681.468	127.02	63.09	3	Hairline Fracture/Feature	Residential Area	
	789.738	110.3	679.438	113.23	65.36	3	Hairline Fracture/Feature	Residential Area	
	789.738	111.72	678.018	125.69	60.84	3	Hairline Fracture/Feature	Residential Area	
	789.738	113.09	676.648	116.74	67.11	3	Hairline Fracture/Feature	Residential Area	
	789.738	122.35	667.388	283.53	30.79	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	124.84	664.898	279.48	29.71	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	125.49	664.248	247.81	36.37	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	127.53	662.208	115.45	82.77	2	Hairline Fracture/Feature	Residential Area	
	789.738	127.77	661.968	244.51	56.04	2	Hairline Fracture/Feature	Residential Area	
	789.738	129.81	659.928	308.8	38.54	2	Hairline Fracture/Feature	Residential Area	
	789.738	130.63	659.108	323.02	51.13	1	Fracture/Feature	Residential Area	
	789.738	133.26	656.478	295.6	21.25	1	Fracture/Feature	Residential Area	
	789.738	139.1	650.638	29.19	14.06	3	Hairline Fracture/Feature	Residential Area	
	789.738	140.62	649.118	300.04	40.61	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	141.64	648.098	296.53	17.31	3	Hairline Fracture/Feature	Residential Area	
	789.738	142.05	647.688	299.01	26.5	3	Fracture/Feature	Residential Area	
	789.738	146.68	643.058	96.8	64	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	149.5	640.238	107.98	68.3	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	150.29	639.448	335.54	59.21	3	Hairline Fracture/Feature	Residential Area	
	789.738	154.6	635.138	69.01	13.35	2	Hairline Fracture/Feature	Residential Area	
	789.738	156.35	633.388	284	57.19	3	Hairline Fracture/Feature	Residential Area	
	789.738	163.44	626.298	285.35	18.79	2	Hairline Fracture/Feature	Residential Area	
	789.738	167.15	622.588	124.06	44.96	1	Hairline Fracture/Feature	Residential Area	
	789.738	167.64	622.098	122.62	48.47	1	Hairline Fracture/Feature	Residential Area	
	789.738	168.19	621.548	109.17	48.64	1	Hairline Fracture/Feature	Residential Area	
	789.738	169.86	619.878	120.62	51.44	1	Hairline Fracture/Feature	Residential Area	
	789.738	171.75	617.988	272.56	22.87	2	Hairline Fracture/Feature	Residential Area	
	789.738	178.09	611.648	115.65	51.35	1	Hairline Fracture/Feature	Residential Area	
	789.738	180.72	609.018	7.18	39.46	1	Hairline Fracture/Feature	Residential Area	
	789.738	182.96	606.778	301.02	58.25	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	186.2	603.538	289.88	60.03	2	Hairline Fracture/Feature	Residential Area	
	789.738	193.13	596.608	155.15	20.88	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	199.06	590.678	286.87	35.41	1	Hairline Fracture/Feature	Residential Area	
	789.738	199.62	590.118	297.6	35.68	1	Hairline Fracture/Feature	Residential Area	
	789.738	200.18	589.558	289.07	45.46	1	Hairline Fracture/Feature	Residential Area	
	789.738	200.98	588.758	305.83	38.91	1	Hairline Fracture/Feature	Residential Area	
	789.738	201.7	588.038	300.01	49.3	1	Hairline Fracture/Feature	Residential Area	
	789.738	202.22	587.518	135.59	72.73	1	Hairline Fracture/Feature	Residential Area	
	789.738	203.04	586.698	6.97	16.84	1	Hairline Fracture/Feature	Residential Area	
	789.738	205.7	584.038	26.17	13.41	3	Hairline Fracture/Feature	Residential Area	
	789.738	206.71	583.028	22	24.17	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	242.53	547.208	119.34	56.63	3	Hairline Fracture/Feature	Residential Area	
	789.738	242.92	546.818	104.67	61.45	3	Hairline Fracture/Feature	Residential Area	
	789.738	243.83	545.908	127.76	78.52	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	251.75	537.988	131.57	63.57	2	Hairline Fracture/Feature	Residential Area	
	789.738	254.37	535.368	104.3	73.77	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	255.61	534.128	26.63	33.98	2	Hairline Fracture/Feature	Residential Area	
	789.738	261.62	528.118	117.34	42.21	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	261.81	527.928	211.31	71.99	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	261.93	527.808	120.59	37.56	3	Hairline Fracture/Feature	Residential Area	
	789.738	262.41	527.328	122.2	48.68	3	Discontinuous Hairline Fracture/Feature	Residential Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-9	789.738	270.63	519.108	51.33	28.73	3	Hairline Fracture/Feature	Residential Area	
	789.738	277.64	512.098	294.43	64.68	2	Hairline Fracture/Feature	Residential Area	
	789.738	278.79	510.948	21.3	70.33	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	789.738	285.44	504.298	117.68	57.68	2	Hairline Fracture/Feature	Residential Area	
MLS-11	710.898	69.83	641.068	141.39	50.96	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	71.27	639.628	177.72	45.9	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	73.61	637.288	281.7	50.68	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	77.38	633.518	149.24	41.93	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	77.76	633.138	322.51	77.46	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	79.04	631.858	167.12	36.16	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	81.74	629.158	114.16	48.1	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	82.08	628.818	266.06	33.8	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	84.18	626.718	140.34	44.46	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	85.38	625.518	137.74	50.29	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	89.59	621.308	155.27	44.56	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	91.56	619.338	159.02	50.45	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	93.29	617.608	168.99	27.89	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	96.89	614.008	151.73	43.48	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	105.56	605.338	281.68	60.97	1	Discontinuous Fracture/Feature	Cowboy Creek	
	710.898	105.65	605.248	266.7	32.86	1	Discontinuous Fracture/Feature	Cowboy Creek	
	710.898	106.43	604.468	131.58	46.92	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	106.7	604.198	143.8	49.97	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	110.28	600.618	129.53	60.55	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	113.26	597.638	292.26	36.08	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	114.6	596.298	149.13	46.25	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	120.52	590.378	301.06	56.94	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	121.87	589.028	121.52	52.24	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	122.3	588.598	124.21	48.84	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	122.67	588.228	116.81	39.78	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	124.63	586.268	149.81	38.81	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	131.65	579.248	129.4	56.43	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	133.91	576.988	258.53	23.96	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	134.82	576.078	120.98	59	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	137.44	573.458	301.52	45.81	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	138.41	572.488	300.75	52.08	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	138.83	572.068	258.21	27.18	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	139.57	571.328	119.93	59.52	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	148.22	562.678	189.09	37.26	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	153.7	557.198	128.32	67.12	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	154.54	556.358	252.69	36.74	1	Hairline Fracture/Feature	Cowboy Creek	
	710.898	158.75	552.148	122.42	48.27	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	160.7	550.198	255.92	62.61	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	162.42	548.478	259.77	36.12	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	166.46	544.438	166.87	41.01	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	169.9	540.998	228.64	67.26	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	170.34	540.558	139.53	54.01	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	170.75	540.148	144	40.95	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	172.73	538.168	147.45	51.8	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	175.03	535.868	44.61	79.01	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	175.48	535.418	243.03	35.91	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	175.49	535.408	39.78	65.11	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	180.83	530.068	150.07	39.6	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	181.19	529.708	148.64	42.74	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	182.94	527.958	150.78	47.67	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	184.92	525.978	158.05	40.34	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	185.67	525.228	14.79	71.85	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	185.87	525.028	170.43	47.46	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	188.74	522.158	167.94	47.77	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	189.64	521.258	165.5	40.68	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	190.34	520.558	169.58	53.72	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	192.93	517.968	266.17	73.8	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	195.66	515.238	180.9	42.71	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	196.9	513.998	56.42	49.8	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	204.3	506.598	100.86	32.56	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	206.64	504.258	332.5	39.35	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	207.25	503.648	223.38	39.88	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	208.48	502.418	8.21	29.64	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	210	500.898	4.75	60.21	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	210.91	499.988	201.27	36.7	3	Fracture/Feature	Cowboy Creek	
	710.898	211.69	499.208	308.96	53.77	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	212.48	498.418	337.12	49.54	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	215.18	495.718	195.92	40.14	2	Bedding/Change in Lithology	Cowboy Creek	
	710.898	216.48	494.418	171.52	52.86	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	218.62	492.278	284.84	58.22	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	220.7	490.198	164.32	48.62	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
	710.898	221.42	489.478	254.45	48.66	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	222.33	488.568	247.46	31.82	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	222.91	487.988	203.74	39.44	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	223.6	487.298	220.87	35.7	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	225.24	485.658	296.24	38.47	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	225.26	485.638	172.79	48	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	226.19	484.708	246.91	36.92	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	226.69	484.208	260.69	29.99	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	227.37	483.528	235.95	35.1	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	227.92	482.978	299.69	36.01	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	228.35	482.548	183.46	49.39	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	230.51	480.388	171.12	31.31	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	231.7	479.198	160.21	43.05	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	241.12	469.778	282.73	24.72	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	242.59	468.308	274.02	28.94	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	243.82	467.078	305.83	22.21	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	244.89	466.008	149.41	67.17	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	246.21	464.688	173.51	57.51	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	247.54	463.358	299.86	39.6	1	Fracture/Feature	Cowboy Creek	
	710.898	247.96	462.938	273.84	41.07	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	248.44	462.458	156.83	47.96	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	251.24	459.658	185.48	51.4	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	252.24	458.658	229.23	34.42	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	253.69	457.208	209.81	43.98	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	254.41	456.488	233.22	41.42	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	254.9	455.998	213.37	51.23	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	255.83	455.068	205.56	39.21	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	256.32	454.578	197.9	48.64	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	257.1	453.798	253.01	29.14	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	257.56	453.338	186.65	35.27	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	258.76	452.138	191.69	47.14	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	259.48	451.418	197.12	50.2	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	260.79	450.108	170.76	61.89	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	262.06	448.838	253.4	22.26	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	262.55	448.348	259.25	15.68	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	267	443.898	180.82	35.55	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	270.11	440.788	280.86	36.54	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
MLS-11	710.898	270.26	440.638	102.44	27.59	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	271.37	439.528	191.45	21.95	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	273.06	437.838	288.95	72.71	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	273.99	436.908	300.33	31.25	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	276.42	434.478	225.08	22.15	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	279.03	431.868	160.54	61.07	1	Hairline Fracture/Feature	Cowboy Creek	
	710.898	281.65	429.248	197.33	21.41	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	282.16	428.738	252.3	41.82	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	284.66	426.238	133.22	34.83	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	285.19	425.708	295.78	23.56	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	285.42	425.478	265.6	38.97	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	285.83	425.068	348.73	18	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	291.07	419.828	164.74	60.1	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	292.1	418.798	218.33	23.74	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	293.4	417.498	310.36	32.93	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	300.28	410.618	232.46	42.64	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	300.95	409.948	220.31	38.53	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	302.04	408.858	253.2	59.21	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	303.54	407.358	207.75	34.66	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	304.1	406.798	337.23	64.25	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	304.69	406.208	226.87	35.8	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	306.87	404.028	26.02	56.54	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	309.13	401.768	239.82	49.55	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	312.37	398.528	327.69	44.1	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	314.75	396.148	121.67	63.53	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	320.19	390.708	227.26	56.11	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	324.07	386.828	156.15	61.07	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	327.79	383.108	248.65	42.03	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	328.9	381.998	159.73	44.03	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	330.09	380.808	268.27	35.66	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	331.18	379.718	211.48	38.8	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	331.24	379.658	89.39	61.23	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	331.94	378.958	77.46	38.42	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	332.73	378.168	162.92	56.46	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	333.1	377.798	51.26	43.06	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	338.15	372.748	260.7	49.74	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	338.92	371.978	185.92	36.94	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	339.81	371.088	153.98	65.1	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-11	710.898	342.77	368.128	123.66	58.57	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	343.01	367.888	311.27	40.37	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	343.48	367.418	302.79	18.14	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	344.24	366.658	262.82	44.81	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	345.07	365.828	147.54	58.18	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	347.01	363.888	149.16	66.1	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	347.23	363.668	246.75	36.53	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	349.22	361.678	357.75	24.24	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	349.74	361.158	272.17	43.55	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	349.74	361.158	237.28	67.62	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	353.83	357.068	137.57	53.38	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	354	356.898	268.8	43.32	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	354.33	356.568	138.79	51.63	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	354.74	356.158	130.27	61.61	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	358.2	352.698	117.83	50.17	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	359.63	351.268	218.94	23.56	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	360.14	350.758	135.03	56.34	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	360.77	350.128	277.58	39.6	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	362.13	348.768	197.78	20.91	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	365.29	345.608	258.75	44.69	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	372.09	338.808	263.86	48.83	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	372.18	338.718	156.24	61.5	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	373.7	337.198	332.33	55.33	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	377.92	332.978	148.94	61.12	2	Hairline Fracture/Feature	Cowboy Creek	
	710.898	378.59	332.308	152.48	60.45	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	386.46	324.438	263.79	29.5	1	Fracture/Feature	Cowboy Creek	
	710.898	387.32	323.578	280.3	49.3	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	387.81	323.088	285.01	48.74	3	Hairline Fracture/Feature	Cowboy Creek	
	710.898	389.31	321.588	260.41	68.06	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	390.35	320.548	256.54	54.89	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	391.71	319.188	250.44	61.65	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	391.99	318.908	152.74	65.32	3	Bedding/Change in Lithology	Cowboy Creek	
	710.898	392.46	318.438	151.16	61.71	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	393.18	317.718	156.57	67.58	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	393.87	317.028	143.68	76.77	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	710.898	398.7	312.198	148.14	42.43	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
MLS-12	919.79	34.28	885.51	87.41	48.9	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	36.91	882.88	311.97	10.34	1	Bedding/Change in Lithology	Source Area	
	919.79	39.35	880.44	176.6	41.46	2	Bedding/Change in Lithology	Source Area	
	919.79	39.38	880.41	266.79	26.89	2	Bedding/Change in Lithology	Source Area	
	919.79	39.82	879.97	137.85	55.54	2	Bedding/Change in Lithology	Source Area	
	919.79	40.1	879.69	269.17	63.21	2	Hairline Fracture/Feature	Source Area	
	919.79	40.31	879.48	127.37	58.86	2	Bedding/Change in Lithology	Source Area	
	919.79	44.02	875.77	181.31	11.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	44.03	875.76	355.97	16.57	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	44.24	875.55	183.84	34.76	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	44.61	875.18	0.72	38.23	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	44.84	874.95	206.22	30.16	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	45.25	874.54	303.98	29.66	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	45.63	874.16	285.63	29.75	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	45.76	874.03	130.82	60.68	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	45.84	873.95	288.55	41.22	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	46.32	873.47	44.11	50.34	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	46.66	873.13	189.24	31.63	2	Bedding/Change in Lithology	Source Area	
	919.79	47.83	871.96	275.86	41.01	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	48.79	871	131.48	78.78	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	49.64	870.15	268.8	43.54	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	51.37	868.42	114.89	65.77	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	53.92	865.87	253.98	21.57	2	Hairline Fracture/Feature	Source Area	
	919.79	55.88	863.91	215.4	17.97	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	56.69	863.1	186.14	44.89	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	57.32	862.47	139.58	58.56	2	Bedding/Change in Lithology	Source Area	
	919.79	58.12	861.67	136.29	58.65	2	Bedding/Change in Lithology	Source Area	
	919.79	59.55	860.24	266.31	59.72	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	59.67	860.12	34.92	34.21	2	Bedding/Change in Lithology	Source Area	
	919.79	60	859.79	141.94	42.15	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	60.52	859.27	78.46	17.41	2	Bedding/Change in Lithology	Source Area	
	919.79	61.87	857.92	127.4	34.88	2	Hairline Fracture/Feature	Source Area	
	919.79	62.62	857.17	109.26	39.77	2	Bedding/Change in Lithology	Source Area	
	919.79	62.84	856.95	139.51	41.34	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	63.57	856.22	355.49	31.95	2	Bedding/Change in Lithology	Source Area	
	919.79	64.32	855.47	72.23	24.54	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	64.83	854.96	248.32	25.31	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	65.47	854.32	161.17	24.49	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	65.72	854.07	280.82	43.36	2	Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-12	919.79	67.06	852.73	291.37	31.95	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	67.22	852.57	17.25	44.21	2	Bedding/Change in Lithology	Source Area	
	919.79	67.27	852.52	243.08	32.19	2	Bedding/Change in Lithology	Source Area	
	919.79	68.55	851.24	286.43	40.68	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	69.85	849.94	135.82	79.47	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	69.87	849.92	333.97	52.83	2	Fracture/Feature	Source Area	
	919.79	72.98	846.81	323.59	38.45	2	Bedding/Change in Lithology	Source Area	
	919.79	73.67	846.12	225.11	51.14	2	Bedding/Change in Lithology	Source Area	
	919.79	74.93	844.86	220.61	48.76	2	Bedding/Change in Lithology	Source Area	
	919.79	76.39	843.4	290.07	48.15	2	Hairline Fracture/Feature	Source Area	
	919.79	77.48	842.31	253.8	59.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	78.16	841.63	275.86	49.95	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	78.42	841.37	325.58	28.74	2	Hairline Fracture/Feature	Source Area	
	919.79	79.59	840.2	271.56	16.37	2	Hairline Fracture/Feature	Source Area	
	919.79	80	839.79	115.59	14.84	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	80.42	839.37	127.3	57.23	2	Hairline Fracture/Feature	Source Area	
	919.79	81.14	838.65	291.08	52.25	2	Hairline Fracture/Feature	Source Area	
	919.79	84.94	834.85	291.7	50.75	2	Hairline Fracture/Feature	Source Area	
	919.79	85.89	833.9	277.09	48.92	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	86.75	833.04	118.98	63.34	2	Bedding/Change in Lithology	Source Area	
	919.79	87.24	832.55	134.29	57.76	2	Bedding/Change in Lithology	Source Area	
	919.79	88.19	831.6	227.64	25.65	2	Bedding/Change in Lithology	Source Area	
	919.79	90.15	829.64	282.86	52.34	2	Hairline Fracture/Feature	Source Area	
	919.79	91.62	828.17	329.27	29.04	2	Bedding/Change in Lithology	Source Area	
	919.79	91.99	827.8	155.14	50.43	2	Bedding/Change in Lithology	Source Area	
	919.79	93.36	826.43	99.92	52.9	2	Fracture/Feature	Source Area	
	919.79	93.75	826.04	297.4	70.85	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	104.69	815.1	124.1	51.07	2	Bedding/Change in Lithology	Source Area	
	919.79	108.57	811.22	152.46	46.04	2	Bedding/Change in Lithology	Source Area	
	919.79	109.13	810.66	133.3	79.25	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	112.79	807	163.07	36.15	3	Bedding/Change in Lithology	Source Area	
	919.79	113.85	805.94	160.62	45.97	3	Bedding/Change in Lithology	Source Area	
	919.79	115.86	803.93	172.61	36.98	2	Bedding/Change in Lithology	Source Area	
	919.79	116.68	803.11	181.52	34.32	2	Bedding/Change in Lithology	Source Area	
	919.79	119.31	800.48	151.28	58.39	2	Bedding/Change in Lithology	Source Area	
	919.79	120.15	799.64	107.75	44.35	2	Bedding/Change in Lithology	Source Area	
	919.79	126.18	793.61	139.37	50.36	2	Hairline Fracture/Feature	Source Area	
	919.79	126.85	792.94	144.05	49.19	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	127.33	792.46	133.96	51.15	3	Bedding/Change in Lithology	Source Area	
	919.79	128.31	791.48	202.6	18.82	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	129.64	790.15	288.22	75.06	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	130.75	789.04	165.8	53.39	3	Bedding/Change in Lithology	Source Area	
	919.79	134.11	785.68	195.92	38.81	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	135.49	784.3	253.89	62.21	2	Hairline Fracture/Feature	Source Area	
	919.79	137	782.79	261.21	46.36	3	Bedding/Change in Lithology	Source Area	
	919.79	137.22	782.57	256.47	47.47	3	Hairline Fracture/Feature	Source Area	
	919.79	139.47	780.32	124.67	45.09	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	140.3	779.49	254.61	55.51	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	140.8	778.99	263.7	49.88	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	141.22	778.57	138.63	75.12	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	141.97	777.82	131.34	57.02	3	Bedding/Change in Lithology	Source Area	
	919.79	142.69	777.1	140.63	37.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	143.1	776.69	115.44	60.96	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	143.39	776.4	132.9	55.85	3	Bedding/Change in Lithology	Source Area	
	919.79	146.64	773.15	137.89	57.96	3	Bedding/Change in Lithology	Source Area	
	919.79	148.14	771.65	136.33	52.79	3	Bedding/Change in Lithology	Source Area	
	919.79	151.33	768.46	317.06	70.57	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	151.4	768.39	145.23	39.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	151.68	768.11	144.49	52.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	152.65	767.14	144.84	70.9	2	Hairline Fracture/Feature	Source Area	
	919.79	153.87	765.92	149.31	37.92	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	156.23	763.56	133.49	70.76	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	157.49	762.3	326.62	87.36	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	158.05	761.74	135.47	68.41	3	Bedding/Change in Lithology	Source Area	
	919.79	160.23	759.56	149.9	46.26	3	Hairline Fracture/Feature	Source Area	
	919.79	161	758.79	137.09	65.03	3	Bedding/Change in Lithology	Source Area	
	919.79	162.09	757.7	132.04	45.08	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	162.44	757.35	129.82	65.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	163.72	756.07	134.82	70.83	3	Bedding/Change in Lithology	Source Area	
	919.79	165.06	754.73	153.23	43.72	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	165.26	754.53	139.55	38.5	3	Bedding/Change in Lithology	Source Area	
	919.79	166.08	753.71	137.92	34.08	3	Bedding/Change in Lithology	Source Area	
	919.79	171.16	748.63	136.4	45.02	3	Bedding/Change in Lithology	Source Area	
	919.79	171.36	748.43	297.27	70.59	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	172.47	747.32	168.07	40.72	3	Hairline Fracture/Feature	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-12	919.79	173.08	746.71	162.6	37.83	3	Hairline Fracture/Feature	Source Area	
	919.79	174.38	745.41	167.81	40.45	3	Hairline Fracture/Feature	Source Area	
	919.79	174.95	744.84	114.66	27.84	3	Bedding/Change in Lithology	Source Area	
	919.79	175.69	744.1	156.42	41.61	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	181.81	737.98	269.28	55.75	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	183.27	736.52	97.09	29.11	1	Hairline Fracture/Feature	Source Area	
	919.79	184.47	735.32	271.84	50.45	3	Bedding/Change in Lithology	Source Area	
	919.79	185.68	734.11	221.81	24.96	2	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	185.97	733.82	157.34	52.38	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	186.13	733.66	191.02	24.79	3	Bedding/Change in Lithology	Source Area	
	919.79	187.63	732.16	157.26	25.54	3	Bedding/Change in Lithology	Source Area	
	919.79	189.63	730.16	277.65	44.95	3	Bedding/Change in Lithology	Source Area	
	919.79	190.17	729.62	250.66	58.87	3	Bedding/Change in Lithology	Source Area	
	919.79	191.68	728.11	311.41	50.7	2	Hairline Fracture/Feature	Source Area	
	919.79	194.21	725.58	274.15	54.86	3	Discontinuous Hairline Fracture/Feature	Source Area	
	919.79	195.1	724.69	137.59	57.99	3	Bedding/Change in Lithology	Source Area	
	919.79	197.06	722.73	89.55	24.26	1	Hairline Fracture/Feature	Source Area	
	919.79	197.5	722.29	110.63	16.73	3	Bedding/Change in Lithology	Source Area	
	919.79	198.58	721.21	113.13	26.94	3	Bedding/Change in Lithology	Source Area	
MLS-13	813.81	23.27	790.54	137.11	33.65	3	Bedding/Change in Lithology	Residential Area	
	813.81	24.56	789.25	125.73	44.44	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	25.76	788.05	286.02	60.91	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	35.07	778.74	99.45	59.74	3	Bedding/Change in Lithology	Residential Area	
	813.81	40.04	773.77	114.05	59.95	3	Bedding/Change in Lithology	Residential Area	
	813.81	40.7	773.11	107.37	65.19	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	41.68	772.13	275.59	20.95	3	Bedding/Change in Lithology	Residential Area	
	813.81	44.86	768.95	124.7	62.2	3	Bedding/Change in Lithology	Residential Area	
	813.81	47.49	766.32	149.59	42.26	3	Bedding/Change in Lithology	Residential Area	
	813.81	48.13	765.68	309.5	74.9	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	49.76	764.05	121.95	39.1	3	Bedding/Change in Lithology	Residential Area	
	813.81	50.65	763.16	137.82	49.87	3	Bedding/Change in Lithology	Residential Area	
	813.81	53.42	760.39	127.85	44.32	3	Bedding/Change in Lithology	Residential Area	
	813.81	53.8	760.01	133.16	47.48	3	Bedding/Change in Lithology	Residential Area	
	813.81	54.26	759.55	131.78	50.17	3	Bedding/Change in Lithology	Residential Area	
	813.81	55	758.81	139.25	55.27	3	Bedding/Change in Lithology	Residential Area	
	813.81	57.77	756.04	129.93	59.89	3	Bedding/Change in Lithology	Residential Area	
	813.81	60.77	753.04	127.07	59.02	3	Bedding/Change in Lithology	Residential Area	
	813.81	65.88	747.93	128.99	78.05	3	Bedding/Change in Lithology	Residential Area	
	813.81	67.75	746.06	131.1	79.54	3	Hairline Fracture/Feature	Residential Area	
	813.81	68.89	744.92	140.99	77.98	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	69.85	743.96	147.71	78.12	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	70.56	743.25	130.29	75.45	3	Bedding/Change in Lithology	Residential Area	
	813.81	73.39	740.42	112.52	55.39	3	Bedding/Change in Lithology	Residential Area	
	813.81	76.27	737.54	127.09	65.39	3	Bedding/Change in Lithology	Residential Area	
	813.81	77.1	736.71	310.64	86.79	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	82.14	731.67	24.34	39.6	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	82.17	731.64	123.03	45.69	3	Bedding/Change in Lithology	Residential Area	
	813.81	84.28	729.53	148.28	44.03	3	Bedding/Change in Lithology	Residential Area	
	813.81	87.22	726.59	128.83	58.29	3	Bedding/Change in Lithology	Residential Area	
	813.81	87.77	726.04	130.11	60.03	3	Bedding/Change in Lithology	Residential Area	
	813.81	89.75	724.06	288.94	64.79	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	90.21	723.6	126.6	55.54	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	90.3	723.51	285.47	61.28	2	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	90.36	723.45	131.76	59.32	3	Bedding/Change in Lithology	Residential Area	
	813.81	90.58	723.23	129.11	58.49	3	Bedding/Change in Lithology	Residential Area	
	813.81	91.4	722.41	142.32	51.52	3	Bedding/Change in Lithology	Residential Area	
	813.81	92.43	721.38	138.08	51.25	3	Bedding/Change in Lithology	Residential Area	
	813.81	93.03	720.78	134.45	50.56	3	Bedding/Change in Lithology	Residential Area	
	813.81	95.03	718.78	137.21	52.09	3	Bedding/Change in Lithology	Residential Area	
	813.81	95.03	718.78	292.65	63.04	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	96.87	716.94	135.07	59.44	3	Bedding/Change in Lithology	Residential Area	
	813.81	97.33	716.48	134.82	51.7	3	Bedding/Change in Lithology	Residential Area	
	813.81	97.94	715.87	139.36	55.72	3	Bedding/Change in Lithology	Residential Area	
	813.81	99.22	714.59	149.39	56.99	3	Fracture/Feature	Residential Area	
	813.81	101.03	712.78	145.89	60.26	3	Bedding/Change in Lithology	Residential Area	
	813.81	103.33	710.48	140.75	50.39	3	Bedding/Change in Lithology	Residential Area	
	813.81	104.04	709.77	149.51	57.28	3	Bedding/Change in Lithology	Residential Area	
	813.81	104.91	708.9	129.21	65.33	3	Hairline Fracture/Feature	Residential Area	
	813.81	106.61	707.2	133.09	67.02	3	Hairline Fracture/Feature	Residential Area	
	813.81	107.22	706.59	133.09	64.98	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	108.9	704.91	126.97	65.97	3	Bedding/Change in Lithology	Residential Area	
	813.81	109.24	704.57	123.23	68.92	3	Bedding/Change in Lithology	Residential Area	
	813.81	109.7	704.11	133.22	65.99	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	110.87	702.94	122.27	73.56	3	Bedding/Change in Lithology	Residential Area	
	813.81	111.7	702.11	126.9	71.92	3	Bedding/Change in Lithology	Residential Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
	813.81	112.41	701.4	125.82	65.77	3	Bedding/Change in Lithology	Residential Area	
	813.81	112.99	700.82	130.19	67.03	3	Bedding/Change in Lithology	Residential Area	
	813.81	114.34	699.47	126.32	71.42	3	Bedding/Change in Lithology	Residential Area	
	813.81	116.4	697.41	136.3	61.94	3	Bedding/Change in Lithology	Residential Area	
	813.81	117	696.81	140.75	60.46	3	Bedding/Change in Lithology	Residential Area	
	813.81	120.32	693.49	131.33	31.56	3	Bedding/Change in Lithology	Residential Area	
	813.81	123.16	690.65	122.64	67.05	3	Bedding/Change in Lithology	Residential Area	
	813.81	126.92	686.89	123.11	79.36	3	Bedding/Change in Lithology	Residential Area	
	813.81	129.97	683.84	136.18	63.89	3	Fracture/Feature	Residential Area	
	813.81	132.65	681.16	125.72	60.2	3	Bedding/Change in Lithology	Residential Area	
	813.81	133.23	680.58	132.42	64.08	3	Bedding/Change in Lithology	Residential Area	
	813.81	134.41	679.4	126.14	60.76	3	Bedding/Change in Lithology	Residential Area	
	813.81	135.6	678.21	126.79	68.91	3	Bedding/Change in Lithology	Residential Area	
	813.81	137.61	676.2	163.22	29.52	3	Bedding/Change in Lithology	Residential Area	
	813.81	141.87	671.94	172.08	52.86	3	Bedding/Change in Lithology	Residential Area	
	813.81	142.49	671.32	137.43	45.51	3	Bedding/Change in Lithology	Residential Area	
	813.81	143.98	669.83	268.34	22.76	3	Bedding/Change in Lithology	Residential Area	
	813.81	144.98	668.83	130.53	56.43	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	146.24	667.57	101.69	69.42	3	Bedding/Change in Lithology	Residential Area	
	813.81	147.19	666.62	123.38	75.87	3	Bedding/Change in Lithology	Residential Area	
	813.81	148.76	665.05	124.54	67.93	3	Bedding/Change in Lithology	Residential Area	
	813.81	149.83	663.98	128.66	71.01	3	Bedding/Change in Lithology	Residential Area	
	813.81	150.22	663.59	151.32	57.62	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	150.8	663.01	146.39	59.98	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	151.35	662.46	134.08	60.53	3	Bedding/Change in Lithology	Residential Area	
	813.81	151.78	662.03	210.35	43.22	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	152.41	661.4	128.46	61.06	3	Bedding/Change in Lithology	Residential Area	
	813.81	154.2	659.61	132.32	53.81	3	Bedding/Change in Lithology	Residential Area	
	813.81	154.78	659.03	133.36	51.07	3	Bedding/Change in Lithology	Residential Area	
	813.81	159.08	654.73	130.49	61.27	3	Bedding/Change in Lithology	Residential Area	
	813.81	160.88	652.93	350.42	75.55	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	161.72	652.09	133	63.14	3	Bedding/Change in Lithology	Residential Area	
	813.81	163.48	650.33	125.05	71.1	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	164.22	649.59	125.1	63.67	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	165.39	648.42	126.56	74.03	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	167.67	646.14	154.78	62.59	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	168.82	644.99	137.24	62.03	3	Discontinuous Hairline Fracture/Feature	Residential Area	
MLS-13	813.81	169.96	643.85	138.8	55.31	3	Bedding/Change in Lithology	Residential Area	
	813.81	171.22	642.59	117.59	43.56	3	Bedding/Change in Lithology	Residential Area	
	813.81	171.49	642.32	115.47	43.63	3	Bedding/Change in Lithology	Residential Area	
	813.81	172.68	641.13	191.11	30.12	3	Bedding/Change in Lithology	Residential Area	
	813.81	174.35	639.46	160.91	56.36	2	Hairline Fracture/Feature	Residential Area	
	813.81	180.57	633.24	151.8	58.22	3	Bedding/Change in Lithology	Residential Area	
	813.81	182.14	631.67	339.02	78.15	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	182.27	631.54	353.52	70.51	1	Hairline Fracture/Feature	Residential Area	
	813.81	194.39	619.42	120.98	68.7	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	195.21	618.6	130.23	51.86	3	Bedding/Change in Lithology	Residential Area	
	813.81	196.83	616.98	183.08	50.39	3	Bedding/Change in Lithology	Residential Area	
	813.81	197.78	616.03	129.64	47.63	3	Bedding/Change in Lithology	Residential Area	
	813.81	201.77	612.04	124.32	69.87	3	Bedding/Change in Lithology	Residential Area	
	813.81	205.96	607.85	127	68.69	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	207.65	606.16	130.38	64.77	3	Bedding/Change in Lithology	Residential Area	
	813.81	208.9	604.91	130.54	68	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	209.15	604.66	130.75	71.41	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	211.51	602.3	142.84	61.21	3	Bedding/Change in Lithology	Residential Area	
	813.81	212.07	601.74	304.23	37.22	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	213.21	600.6	126.11	68.17	3	Bedding/Change in Lithology	Residential Area	
	813.81	217.49	596.32	113.32	69.97	3	Bedding/Change in Lithology	Residential Area	
	813.81	218.03	595.78	284.47	45.88	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	220.47	593.34	129.93	65.88	3	Bedding/Change in Lithology	Residential Area	
	813.81	220.9	592.91	275.85	56.64	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	222.5	591.31	276.09	53.38	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	223.13	590.68	265.65	51.56	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	223.5	590.31	255.89	56.38	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	224.8	589.01	130.24	65.78	3	Bedding/Change in Lithology	Residential Area	
	813.81	228.35	585.46	285.56	16.89	3	Bedding/Change in Lithology	Residential Area	
	813.81	229.08	584.73	133.03	59.07	3	Bedding/Change in Lithology	Residential Area	
	813.81	230.11	583.7	129.12	53.97	3	Bedding/Change in Lithology	Residential Area	
	813.81	230.3	583.51	266.53	48.45	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	230.78	583.03	130.68	56.98	3	Bedding/Change in Lithology	Residential Area	
	813.81	231.09	582.72	318.5	42.04	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	233.61	580.2	128.96	75.99	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	238.1	575.71	129.11	76.49	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	238.83	574.98	127.58	70.1	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	241.01	572.8	147.17	46.16	3	Bedding/Change in Lithology	Residential Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-13	813.81	242.22	571.59	137.7	55.55	3	Bedding/Change in Lithology	Residential Area	
	813.81	254.69	559.12	122.57	56.57	3	Bedding/Change in Lithology	Residential Area	
	813.81	255.68	558.13	124.55	56.29	3	Bedding/Change in Lithology	Residential Area	
	813.81	256.01	557.8	146.34	53.2	3	Bedding/Change in Lithology	Residential Area	
	813.81	257	556.81	104.41	59.1	3	Bedding/Change in Lithology	Residential Area	
	813.81	258	555.81	134.78	50.37	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	259.44	554.37	124.99	58.61	3	Bedding/Change in Lithology	Residential Area	
	813.81	259.79	554.02	124.47	62.77	3	Bedding/Change in Lithology	Residential Area	
	813.81	260.27	553.54	118.39	63.15	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	260.93	552.88	127.67	57.14	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	261.99	551.82	126.28	59.73	3	Bedding/Change in Lithology	Residential Area	
	813.81	262.71	551.1	130.26	59.17	3	Bedding/Change in Lithology	Residential Area	
	813.81	264.04	549.77	157.99	44.34	3	Bedding/Change in Lithology	Residential Area	
	813.81	269.87	543.94	124.26	60.56	3	Bedding/Change in Lithology	Residential Area	
	813.81	271.5	542.31	134.65	64.72	3	Bedding/Change in Lithology	Residential Area	
	813.81	275.2	538.61	138.46	49.29	3	Bedding/Change in Lithology	Residential Area	
	813.81	277.53	536.28	164.07	57.66	3	Bedding/Change in Lithology	Residential Area	
	813.81	277.6	536.21	134.54	80.18	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	279.03	534.78	140.44	70.98	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	279.76	534.05	139.62	54.49	3	Bedding/Change in Lithology	Residential Area	
	813.81	287.32	526.49	331.48	37.09	3	Bedding/Change in Lithology	Residential Area	
	813.81	293.49	520.32	185.3	72.23	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	295.5	518.31	197.91	78.34	3	Discontinuous Hairline Fracture/Feature	Residential Area	
	813.81	296.25	517.56	186.91	71.55	3	Discontinuous Hairline Fracture/Feature	Residential Area	
MLS-14	712.56	56.66	655.9	330.85	76.12	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	56.95	655.61	328.39	66.77	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	58.44	654.12	149.8	24.75	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	59.65	652.91	167.38	16.15	3	Hairline Fracture/Feature	Cowboy Creek	
	712.56	61.69	650.87	165.6	51.29	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	62.43	650.13	170.22	49.73	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	63.89	648.67	293.1	59.75	2	Hairline Fracture/Feature	Cowboy Creek	
	712.56	64.45	648.11	296.65	63.86	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	65.92	646.64	147.96	45.49	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	66.42	646.14	132.72	40.79	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	66.67	645.89	353.37	71.19	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	68.21	644.35	138.4	46.05	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	68.52	644.04	135.85	42.38	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	68.59	643.97	296.23	60.49	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	69.55	643.01	150.71	18.53	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	70.55	642.01	315.81	77.1	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	71.47	641.09	333.99	55.49	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	72.76	639.8	89.17	29.87	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	73.08	639.48	287.34	48.67	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	73.63	638.93	274.32	43.84	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	74.65	637.91	250.83	41.27	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	74.8	637.76	111.35	37.17	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	75.89	636.67	245.47	36.57	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	76.05	636.51	350.39	73.94	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	76.85	635.71	278.69	39.48	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	78.08	634.48	282.76	39.86	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	79.77	632.79	281.2	67.01	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	80.76	631.8	272.67	56.74	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	83.32	629.24	283.32	66.83	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	83.88	628.68	279.56	56.66	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	84.58	627.98	19.17	39.34	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	87.88	624.68	330.27	71.77	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	88.42	624.14	282.48	61.69	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	88.83	623.73	307.11	14.94	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	89.47	623.09	166.32	43.59	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	89.65	622.91	155.78	64.86	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	91.36	621.2	305.96	64.15	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	92.16	620.4	123.46	32.76	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	95.14	617.42	127.35	14.2	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	95.42	617.14	341.53	13.03	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	97.33	615.23	307.64	38.96	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	97.81	614.75	174.11	55.36	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	105.66	606.9	152.49	75.82	1	Fracture/Feature	Cowboy Creek	
	712.56	107.51	605.05	142.15	69.94	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	108.87	603.69	90.06	63.06	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	110.22	602.34	149.11	64	1	Fracture/Feature	Cowboy Creek	
	712.56	113.78	598.78	148.96	66.74	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	116.66	595.9	313.39	62.11	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	125.14	587.42	302.56	84.6	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	125.46	587.1	120.82	59.72	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	132.03	580.53	73.45	30.25	3	Bedding/Change in Lithology	Cowboy Creek	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MLS-14	712.56	133.31	579.25	70.01	27.96	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	137.92	574.64	180.28	56.24	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	140.53	572.03	165.24	71.84	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	141.18	571.38	296.51	39.83	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	141.34	p	166.91	64.12	2	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	150.2	562.36	157.08	28.11	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	154.71	557.85	357.88	13.22	1	Hairline Fracture/Feature	Cowboy Creek	
	712.56	169.22	543.34	221.04	17.33	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	174	538.56	308.09	64.41	2	Hairline Fracture/Feature	Cowboy Creek	
	712.56	174.59	537.97	170.41	29.92	1	Fracture/Feature	Cowboy Creek	
	712.56	182.46	530.1	111.56	27.28	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	187.96	524.6	250.87	24.98	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	194.47	518.09	13.25	52.32	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	195.52	517.04	172.63	46.72	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	198.14	514.42	123.85	19.7	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	202.13	510.43	195.61	28.42	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	203.3	509.26	98.09	36.81	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	204.82	507.74	93.73	33.51	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	205.8	506.76	93.67	31.74	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	206.72	505.84	105.92	43.36	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	207.16	505.4	108.54	30.81	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	207.48	505.08	116.89	30.27	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	210.06	502.5	117.03	53.24	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	211.82	500.74	149.93	30.2	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	219.39	493.17	89.95	40.9	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	220.83	491.73	149.83	76.79	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	222.45	490.11	88.34	35.45	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	224.23	488.33	178.33	35.56	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	225.79	486.77	22.51	60.81	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	228	484.56	11.22	64.14	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	230.41	482.15	69.36	49.43	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	231.4	481.16	54.29	47.79	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	234.95	477.61	25.54	64.72	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	235.7	476.86	215.04	17.67	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	237.3	475.26	2.72	69.27	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	254.34	458.22	108.33	36.42	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	257.34	455.22	262.26	23.73	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	261.12	451.44	155.23	46.25	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	271.17	441.39	126.52	89.33	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	282.75	429.81	167.09	31.71	3	Bedding/Change in Lithology	Cowboy Creek	
	712.56	287.81	424.75	359.57	62.1	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	290.41	422.15	336.8	66.64	3	Discontinuous Hairline Fracture/Feature	Cowboy Creek	
	712.56	296.73	415.83	22.4	60.82	3	Bedding/Change in Lithology	Cowboy Creek	
MW-15b	877.5	23.49	854.01	251.51	55.66	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	23.81	853.69	63.46	61.62	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	24.25	853.25	122.16	50.86	3	Bedding/Change in Lithology	Source Area	
	877.5	25.7	851.8	86.35	45.15	3	Bedding/Change in Lithology	Source Area	
	877.5	26.79	850.71	265.09	58.21	3	Bedding/Change in Lithology	Source Area	
	877.5	27.09	850.41	260.98	65.15	3	Bedding/Change in Lithology	Source Area	
	877.5	27.98	849.52	248.91	56.22	3	Bedding/Change in Lithology	Source Area	
	877.5	28.14	849.36	251.58	67.11	3	Bedding/Change in Lithology	Source Area	
	877.5	29.14	848.36	255.27	57.32	3	Bedding/Change in Lithology	Source Area	
	877.5	29.6	847.9	263.95	62.34	3	Bedding/Change in Lithology	Source Area	
	877.5	29.74	847.76	261.69	64.45	3	Bedding/Change in Lithology	Source Area	
	877.5	31.63	845.87	267.71	64.55	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	32.2	845.3	257.1	61.66	3	Bedding/Change in Lithology	Source Area	
	877.5	32.6	844.9	259.92	62.9	3	Bedding/Change in Lithology	Source Area	
	877.5	33.15	844.35	139.01	53.46	3	Bedding/Change in Lithology	Source Area	
	877.5	34.88	842.62	247.66	41.45	3	Bedding/Change in Lithology	Source Area	
	877.5	35.53	841.97	136.17	65.24	2	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	35.88	841.62	137.76	63.6	2	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	37.31	840.19	263.36	61.66	3	Bedding/Change in Lithology	Source Area	
	877.5	38.11	839.39	254.82	66.16	3	Bedding/Change in Lithology	Source Area	
	877.5	41.97	835.53	263.55	63.95	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	42.19	835.31	273.32	59.6	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	43.43	834.07	265.1	58.37	3	Bedding/Change in Lithology	Source Area	
	877.5	45.34	832.16	65.97	53.71	3	Bedding/Change in Lithology	Source Area	
	877.5	45.66	831.84	224.79	24.82	3	Bedding/Change in Lithology	Source Area	
	877.5	46.79	830.71	198.6	27.1	3	Bedding/Change in Lithology	Source Area	
	877.5	47.46	830.04	132.01	36.11	3	Bedding/Change in Lithology	Source Area	
	877.5	48.35	829.15	86.16	11.02	3	Bedding/Change in Lithology	Source Area	
	877.5	53.73	823.77	101.96	61.78	2	Bedding/Change in Lithology	Source Area	
	877.5	54.8	822.7	274.36	21.6	3	Bedding/Change in Lithology	Source Area	
	877.5	55	822.5	276.89	41.47	3	Bedding/Change in Lithology	Source Area	
	877.5	55.36	822.14	261.53	40.35	3	Bedding/Change in Lithology	Source Area	

Table 3-1
Potentially Significant Fractures
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Ground Elevation (ft NAVD88)	Fracture Depth (ft bgs)	Fracture Elev. (ft NAVD88)	Dip Azimuth (deg. from north)	Dip Angle (deg.)	Transmissivity Classification	Feature Description	Area	Notes
MW-15b	877.5	57.92	819.58	278.6	41.06	3	Bedding/Change in Lithology	Source Area	
	877.5	58.36	819.14	258.93	46.17	3	Bedding/Change in Lithology	Source Area	
	877.5	60.54	816.96	157.03	26.68	3	Bedding/Change in Lithology	Source Area	
	877.5	61.36	816.14	116.75	42.14	3	Bedding/Change in Lithology	Source Area	
	877.5	61.52	815.98	136.15	30.95	3	Bedding/Change in Lithology	Source Area	
	877.5	62	815.5	281.74	28.56	3	Bedding/Change in Lithology	Source Area	
	877.5	62.49	815.01	214.56	34.05	3	Bedding/Change in Lithology	Source Area	
	877.5	62.92	814.58	142.6	24.41	3	Bedding/Change in Lithology	Source Area	
	877.5	63.23	814.27	259.05	68.87	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	64.22	813.28	145.69	40.71	3	Bedding/Change in Lithology	Source Area	
	877.5	64.6	812.9	119.76	56.46	3	Bedding/Change in Lithology	Source Area	
	877.5	65.44	812.06	194.76	15.75	3	Bedding/Change in Lithology	Source Area	
	877.5	67.22	810.28	252.77	30.63	3	Fracture/Feature	Source Area	
	877.5	67.65	809.85	286	63.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	71.42	806.08	257.87	30.02	3	Bedding/Change in Lithology	Source Area	
	877.5	73.45	804.05	247.02	21.01	3	Bedding/Change in Lithology	Source Area	
	877.5	76.39	801.11	227.24	14.53	3	Bedding/Change in Lithology	Source Area	
	877.5	76.69	800.81	258.14	21.18	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	76.75	800.75	188.59	17.36	3	Bedding/Change in Lithology	Source Area	
	877.5	79.91	797.59	136.63	70.99	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	80.62	796.88	297.11	38.37	3	Bedding/Change in Lithology	Source Area	
	877.5	80.83	796.67	142.47	69.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	81.18	796.32	295.08	36.72	3	Hairline Fracture/Feature	Source Area	
	877.5	82.88	794.62	292.94	49.67	3	Hairline Fracture/Feature	Source Area	
	877.5	83.37	794.13	159.1	35.7	3	Bedding/Change in Lithology	Source Area	
	877.5	84.05	793.45	157.41	35.44	3	Bedding/Change in Lithology	Source Area	
	877.5	86.04	791.46	302.44	71.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	86.08	791.42	283.63	55.97	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	86.73	790.77	306.92	68.25	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	86.99	790.51	178.09	43.8	3	Bedding/Change in Lithology	Source Area	
	877.5	88.17	789.33	216.91	27.17	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	88.7	788.8	274.77	58.28	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	89.9	787.6	150.67	36.13	3	Bedding/Change in Lithology	Source Area	
	877.5	90.48	787.02	322.92	19.87	3	Hairline Fracture/Feature	Source Area	
	877.5	92	785.5	140.04	33.06	3	Bedding/Change in Lithology	Source Area	
	877.5	92.54	784.96	113.71	24.55	3	Bedding/Change in Lithology	Source Area	
	877.5	92.72	784.78	57.84	61.69	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	93.65	783.85	243	47.62	3	Hairline Fracture/Feature	Source Area	
	877.5	95.39	782.11	303.18	83.34	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	95.59	781.91	284.62	46.45	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	95.88	781.62	144.25	54.18	3	Bedding/Change in Lithology	Source Area	
	877.5	96.98	780.52	314.3	80.77	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	97.27	780.23	108.14	51.45	3	Bedding/Change in Lithology	Source Area	
	877.5	99.04	778.46	275.93	63.61	3	Discontinuous Hairline Fracture/Feature	Source Area	
	877.5	99.56	777.94	115.82	31.52	3	Bedding/Change in Lithology	Source Area	
	877.5	100.23	777.27	258.21	54.77	3	Hairline Fracture/Feature	Source Area	

Notes:
deg: degrees
ft bgs: feet below ground surface
NAVD88: North American Vertical Datum of 1988
Transmissivity classification based on multiple lines of evidence from borehole geophysics analysis. See Section 3.4.2.3 for discussion.
Transmissivity Classification: 1 - Transmissive, 2 - Possibly transmissive, 3 - Not transmissive
Significance based on multiple lines of evidence from borehole geophysics analysis.
Source area includes: MLS 1-7, MLS-12, MW-15b
Residental area includes: MLS-8, MLS-9,MLS-13
Cowboy creek includes: MLS-11, MLS-14

Table 3-2
Fracture Density by Boring
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Total Borehole Fractures/ foot logged	Fracture Elevation (feet NAVD88)	Fractures per 20 feet: Depth Interval[1] (feet bgs)	Fractures per 20 feet: Borehole Fractures/foot	Notes
MW-1	0.65		2-34	N/A	Not logged, depth of bedrock inferred from adjacent MLS-6
			34-54	0.80	
			54-74	0.40	
			74-94	0.80	
			94-110	0.25	
MW-2	0.67		14.5-20	N/A	Not logged, depth of bedrock inferred from adjacent MLS-5
			20-40	0.65	
			40-60	0.65	
			60-80	1.05	
			80-100	0.65	
			100-120	0.05	
MLS-1	0.06	905.00	10-23	N/A	No downhole geophysics
		892.00	23-43	0.35	
		872.00	43-60	0.05	
		852.00	63-83	0.10	
		832.00	83-103	0.20	
		812.00	103-123	0.00	
		792.00	123-143	0.00	
		772.00	143-163	0.00	
		752.00	163-183	0.00	
		732.00	183-203	0.05	
		712.00	203-223	0.00	
		692.00	223-243	0.05	
		672.00	243-263	0.00	
		652.00	263-283	0.00	
		632.00	283-303	0.25	
		612.00	303-323	0.00	
		592.00	323-343	0.00	
		572.00	343-363	0.00	
		552.00	363-383	0.00	
		532.00	383-401	0.00	
MLS-2	0.01	909.90	5-20	N/A	No downhole geophysics
		894.90	20-40	0.00	
		874.90	40-60	0.00	
		854.90	60-80	0.00	
		834.90	80-100	0.05	
		814.90	100-120	0.00	
		794.90	120-140	0.00	
		774.90	140-160	0.00	
		754.90	160-180	0.00	
		734.90	180-200	0.00	
		714.90	200-220	0.00	
		694.90	220-240	0.00	
		674.90	240-260	0.00	
		654.90	260-280	0.00	
		634.90	280-300	0.00	
		614.90	300-320	0.05	
		594.90	320-340	0.00	
		574.90	340-360	0.00	
		554.90	360-380	0.00	

Table 3-2
Fracture Density by Boring
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Total Borehole Fractures/ foot logged	Fracture Elevation (feet NAVD88)	Fractures per 20 feet		Notes
			Depth Interval[1] (feet bgs)	Borehole Fractures/foot	
MLS-3	0.13	945.60	3-60	N/A	No downhole geophysics
		888.60	60-80	0.65	
		868.60	80-100	0.15	
		848.60	100-120	0.25	
		828.60	120-140	0.15	
		808.60	140-160	0.05	
		788.60	160-180	0.10	
		768.60	180-200	0.25	
		748.60	200-220	0.00	
		728.60	220-240	0.05	
		708.60	240-260	0.05	
		688.60	260-280	0.05	
		668.60	280-300	0.10	
		648.60	300-320	0.25	
		628.60	320-340	0.15	
		608.60	340-360	0.00	
		588.60	360-380	0.00	
		568.60	380-400	0.00	
MLS-4	0.18	954.80	1-12	N/A	No downhole geophysics
		943.80	12-32	0.30	
		923.80	32-52	0.70	
		903.80	52-72	0.15	
		883.80	72-92	0.30	
		863.80	92-112	0.25	
		843.80	112-132	0.60	
		823.80	132-152	0.25	
		803.80	152-172	0.00	
		783.80	172-192	0.10	
		763.80	192-212	0.25	
		743.80	212-232	0.05	
		723.80	232-252	0.15	
		703.80	252-272	0.10	
		683.80	272-292	0.30	
		663.80	292-312	0.55	
		643.80	312-332	0.35	
		623.80	332-352	0.00	
		603.80	352-372	0.00	
		583.80	372-392	0.00	
		563.80	392-412	0.00	
		543.80	412-432	0.00	
		523.80	432-452	0.00	
		503.80	452-472	0.00	
		483.80	472-500	0.00	
MLS-5	0.30	903.40	14.5-24	N/A	No downhole geophysics
		893.90	24-44	0.00	
		873.90	44-64	1.30	
		853.90	64-84	1.15	
		833.90	84-104	1.05	
		813.90	104-124	0.25	
		793.90	124-144	0.40	
		773.90	144-164	0.05	
		753.90	164-184	0.10	
		733.90	184-204	0.50	
		713.90	204-224	0.05	
		693.90	224-244	0.00	
		673.90	244-264	0.05	
		653.90	264-284	0.00	
		633.90	284-304	0.10	
		613.90	304-324	0.05	
		593.90	324-344	0.00	
		573.90	344-364	0.25	
		553.90	364-384	0.20	
		533.90	384-400	0.13	

Table 3-2
Fracture Density by Boring
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Total Borehole Fractures/ foot logged	Fracture Elevation (feet NAVD88)	Fractures per 20 feet		Notes
			Depth Interval[1] (feet bgs)	Borehole Fractures/foot	
MLS-6	0.23	917.00	2-26	N/A	No downhole geophysics
		893.00	26-46	0.35	
		873.00	46-66	0.55	
		853.00	66-86	0.10	
		833.00	86-106	0.50	
		813.00	106-126	0.50	
		793.00	126-146	0.05	
		773.00	146-166	0.00	
		753.00	166-186	0.20	
		733.00	186-206	0.25	
		713.00	206-226	0.30	
		693.00	226-246	0.30	
		673.00	246-266	0.20	
		653.00	266-286	0.05	
		633.00	286-306	0.05	
		613.00	306-326	0.25	
		593.00	326-337	0.09	
MLS-7	0.25	895.70	6-28	N/A	No downhole geophysics
		873.70	28-48	0.30	
		853.70	48-68	0.75	
		833.70	68-88	1.20	
		813.70	88-108	0.00	
		793.70	108-128	0.65	
		773.70	128-148	0.10	
		753.70	148-168	0.20	
		733.70	168-188	0.05	
		713.70	188-208	0.20	
		693.70	208-228	0.00	
		673.70	228-248	0.10	
		653.70	248-268	0.15	
		633.70	268-288	0.05	
		613.70	288-308	0.20	
		593.70	308-328	0.10	
		573.70	328-348	0.05	
		553.70	348-368	0.15	
		533.70	368-388	0.15	
		513.70	388-400	0.33	
MLS-8	0.26	848.20	8-20	N/A	No downhole geophysics
		830.20	20-40	0.30	
		810.20	40-60	0.40	
		790.20	60-80	0.70	
		770.20	80-100	0.60	
		750.20	100-120	0.25	
		730.20	120-140	0.20	
		710.20	140-160	0.05	
		690.20	160-180	0.10	
		670.20	180-200	0.15	
		650.20	200-220	0.35	
		630.20	220-240	0.20	
		610.20	240-260	0.20	
		590.20	260-280	0.05	
		570.20	280-300	0.15	

Table 3-2
Fracture Density by Boring
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Total Borehole Fractures/ foot logged	Fracture Elevation (feet NAVD88)	Fractures per 20 feet		Notes
			Depth Interval[1] (feet bgs)	Borehole Fractures/foot	
MLS-9	0.20	748.70	41-50	N/A	No downhole geophysics
		739.70	50-70	0.60	
		719.70	70-90	0.35	
		699.70	90-110	0.05	
		679.70	110-130	0.15	
		659.70	130-150	0.10	
		639.70	150-170	0.30	
		619.70	170-190	0.25	
		599.70	190-210	0.35	
		579.70	210-230	0.00	
		559.70	230-250	0.00	
		539.70	250-270	0.15	
		519.70	270-290	0.10	
MLS-11	0.12	678.90	32-60	N/A	No downhole geophysics
		650.90	60-80	0.05	
		630.90	80-100	0.10	
		610.90	100-120	0.25	
		590.90	120-140	0.05	
		570.90	140-160	0.05	
		550.90	160-180	0.05	
		530.90	180-200	0.20	
		510.90	200-220	0.15	
		490.90	220-240	0.05	
		470.90	240-260	0.05	
		450.90	260-280	0.05	
		430.90	280-300	0.15	
		410.90	300-320	0.30	
		390.90	320-340	0.05	
		370.90	340-360	0.35	
		350.90	360-380	0.10	
		330.90	380-400	0.05	
MLS-12	0.44	904.90	15-20	N/A	No downhole geophysics
		899.80	20-40	0.20	
		879.80	40-60	1.25	
		859.80	60-80	1.20	
		839.80	80-100	0.60	
		819.80	100-120	0.30	
		799.80	120-140	0.15	
		779.80	140-160	0.05	
		759.80	160-180	0.00	
		739.80	180-200	0.20	
MLS-13	0.025	809.80	4-20	N/A	No downhole geophysics
		793.80	20-40	0.00	
		773.80	40-60	0.05	
		753.80	60-80	0.05	
		733.80	80-100	0.15	
		713.80	100-120	0.00	
		693.80	120-140	0.00	
		673.80	140-160	0.00	
		653.80	160-180	0.05	
		633.80	180-200	0.05	
		613.80	200-220	0.00	
		593.80	220-240	0.00	
		573.80	240-260	0.00	
		553.80	260-280	0.00	
		533.80	280-300	0.00	

Table 3-2
Fracture Density by Boring
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well	Total Borehole Fractures/ foot logged	Fracture Elevation (feet NAVD88)	Fractures per 20 feet		Notes
			Depth Interval[1] (feet bgs)	Borehole Fractures/foot	
MLS-14	0.058	672.60	40-60	0.00	
		652.60	60-80	0.20	
		632.60	80-100	0.10	
		612.60	100-120	0.20	
		592.60	120-140	0.00	
		572.60	140-160	0.15	
		552.60	160-180	0.10	
		532.60	180-200	0.00	
		512.60	200-220	0.00	
		492.60	220-240	0.00	
		472.60	240-260	0.00	
		452.60	260-280	0.00	
		432.60	280-300	0.00	
MW-15b	0.029	877.50	0-18	0.00	No downhole geophysics
		859.50	18-40	0.10	
		837.50	40-60	0.05	
		817.50	60-80	0.00	
		797.50	80-100	0.00	

Notes:
bgs: below ground surface
NAVD88: North American Vertical Datum of 1988

[1:] MLS-4MLS-11 fracture depths in ft btoc

ft btoc = feet below top of casing; ft btor = feet below top of rock (bedrock surface) MLS-2 ATV run through liner; may not have detected smallest fractures

Statistics calculated for portion of log with available ATV data.

Only fractures identified as being transmissive or potentially transmissive (category 1 and 2 were tabulated)

Table 3-3
Packer Testing Results
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Zone	Table Order	Depth Interval	Tranmissivity (ft^2/day)	Category[1]	Test Type	Rationale
MLS-1-1	1	285-300	19.500	Moderate	Inflation response	Average of tests
MLS-1-2	2	225-240	12.150	Moderate	Inflation response	Test 1
MLS-1-3	3	177-192	0.018	Low	Dewatering recovery	Only 1 Test
MLS-1-4	4	120-135	0.207	Low	Dewatering recovery	Only 1 Test
MLS-1-5	5	105-120	0.035	Low	Dewatering recovery	Only 1 Test
MLS-1-6	6	85-100	14.550	Moderate	Inflation response	Test 1
MLS-1-7	7	70-85	0.032	Low	Dewatering recovery	Only 1 Test
MLS-1-8	8	53-68	0.074	Low	Dewatering recovery	Only 1 Test
MLS-1-9	9	30-45	0.105	Low	Dewatering recovery	Only 1 Test
MLS-2-1	10	340-355	ND	ND	--	Flow rate too variable to determine pumping curve
MLS-2-2	11	295-310	0.240	Low	Stabilized pumping	Only 1 Test
MLS-2-3	12	230-245	0.0	Negligible	--	No Recharge
MLS-2-4	13	165-180	0.0	Negligible	--	No Recharge
MLS-2-5	14	119-134	0.0	Negligible	--	No Recharge
MLS-2-6	15	100-115	0.0	Negligible	--	No Recharge
MLS-2-7	16	75-90	0.0	Negligible	--	No Recharge
MLS-2-8	17	55-70	0.0	Negligible	--	No Recharge
MLS-3-1	18	325-340	0.0	Negligible	--	No Recharge
MLS-3-2	19	295-310	52.500	Moderate	Stabilized pumping	Average of tests
MLS-3-3	20	240-255	5.850	Moderate	Stabilized pumping	Only 1 Test
MLS-3-4	21	215-230	3.000	Moderate	Stabilized pumping	Only 1 Test
MLS-3-5	22	180-195	1.500	Moderate	Stabilized pumping	Only 1 Test
MLS-3-6	23	165-180	4.800	Moderate	Stabilized pumping	Only 1 Test
MLS-3-7	24	110-125	28.500	Moderate	Inflation response	Test 1
MLS-3-8	25	95-110	0.003	Low	Dewatering recovery	Only 1 Test
MLS-3-9	26	60-85	30.000	Moderate	Inflation response	Test 1 since poor curve fit for pumping data
MLS-4-1	27	73-88	0.0	Negligible	--	No Recharge
MLS-4-2	28	94-109	0.0	Negligible	--	No Recharge
MLS-4-3	29	110-125	0.0	Negligible	--	No Recharge
MLS-4-4	30	125-140	0.0	Negligible	--	No Recharge
MLS-4-5	31	165-180	0.0	Negligible	--	No Recharge
MLS-4-6	32	200-215	1.170	Low	Stabilized pumping	Only 1 Test
MLS-4-7	33	240-255	0.0	Negligible	--	No Recharge
MLS-4-8	34	285-300	4.350	Moderate	Stabilized pumping	Only 1 Test
MLS-4-9	35	310-325	ND	ND	--	Water levels too variable to determine pumping curve
MLS-4-10	36	361-376	ND	ND	--	Not recorded
MLS-4-11	37	398-413	ND	ND	--	Not recorded
MLS-4-12	38	450-465	ND	ND	--	Not recorded
MLS-4-13	39	481-496	ND	ND	--	Not recorded
MLS-5-1	40	34-49	18.000	Moderate	Stabilized pumping	Average of tests
MLS-5-2	41	52-67	8.850	Moderate	Stabilized pumping	Average of tests
MLS-5-3	42	75-90	ND	ND	--	Insufficient data
MLS-5-4	43	102-117	0.975	Low	Stabilized pumping	Test 1
MLS-5-5	44	142-157	0.0	Negligible	--	No Recharge
MLS-5-6	45	194-209	0.0	Negligible	--	No Recharge
MLS-5-7	46	222-237	0.0	Negligible	--	No Recharge
MLS-5-8	47	258-273	0.0	Negligible	--	No Recharge
MLS-5-9	48	313-328	1.800	Moderate	Stabilized pumping	Only 1 Test
MLS-6-1	49	30-45	0.0	Negligible	--	No Recharge
MLS-6-2	50	50-65	0.0	Negligible	--	No Recharge
MLS-6-3	51	80-95	0.0	Negligible	--	No Recharge
MLS-6-4	52	95-110	1.950	Moderate	Stabilized pumping	Only 1 Test
MLS-6-5	53	110-125	1.200	Low	Stabilized pumping	Only 1 Test
MLS-6-6	54	140-155	0.0	Negligible	--	No Recharge
MLS-6-7	55	160-175	19.500	Moderate	Stabilized pumping	Only 1 Test
MLS-6-8	56	180-195	ND	ND	--	Insufficient data
MLS-6-9	57	200-215	ND	ND	--	Insufficient data
MLS-6-10	58	220-235	ND	ND	--	Insufficient data
MLS-6-11	59	235-250	ND	ND	--	Insufficient data
MLS-6-12	60	295-310	1.260	Low	Stabilized pumping	Only 1 Test
MLS-6-13	61	321-336	ND	ND	--	Insufficient data
MLS-7-1	62	35-50	ND	ND	--	Insufficient data
MLS-7-2	63	67-82	ND	ND	--	Insufficient data
MLS-7-3	64	101-116	ND	ND	--	Insufficient data
MLS-7-4	65	119-134	ND	ND	--	Insufficient data
MLS-7-5	66	148-163	0.0	Negligible	--	No Recharge
MLS-7-6	67	170-185	0.0	Negligible	--	No Recharge
MLS-7-7	68	237-252	0.0	Negligible	--	No Recharge
MLS-7-8	69	270-285	2.100	Moderate	Stabilized pumping	Only 1 Test
MLS-7-9	70	295-310	0.0	Negligible	--	No Recharge
MLS-7-10	71	376-391	ND	ND	--	Insufficient data
MLS-8-1	72	281-296	ND	ND	--	Insufficient data
MLS-8-2	73	265-280	1.035	Low	Stabilized pumping	Only 1 Test
MLS-8-3	74	235-250	0.0	Negligible	--	No Recharge
MLS-8-4	75	205-220	0.0	Negligible	--	No Recharge
MLS-8-5	76	181-196	0.0	Negligible	--	No Recharge
MLS-8-6	77	156-171	0.0	Negligible	--	No Recharge
MLS-8-7	78	128-143	0.041	Low	Dewatering recovery	Only 1 Test
MLS-8-8	79	108-123	1.035	Low	Stabilized pumping	Only 1 Test
MLS-8-9	80	88-103	0.072	Low	Dewatering recovery	Only 1 Test
MLS-8-10	81	70-85	Low	Low	--	produces water (qualitative observation); non-stabilized pumping and no recovery test
MLS-8-11	82	55-70	Low	Low	--	minor recharge (field observation); non-stabilized pumping; most pumping times not
MLS-9-1	83	54-69	High	High	--	good producer, but flow rate not recorded. Unable to calculate
MLS-9-2	84	82-97	ND	ND	--	Insufficient data

CDM Smith

Table 3-3
Packer Testing Results
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Zone	Table Order	Depth Interval	Tranmissivity (ft^2/day)	Category[1]	Test Type	Rationale
MLS-9-3	85	100-115	ND	ND	--	Insufficient data
MLS-9-4	86	125-140	ND	ND	--	Insufficient data
MLS-9-5	87	160-175	42.000	Moderate	Stabilized pumping	Only 1 Test
MLS-9-6	88	175-190	129.000	Moderate	Stabilized pumping	Only 1 Test
MLS-9-7	89	242-257	1.950	Moderate	Stabilized pumping	Average of tests
MLS-9-8	90	271-286	ND	ND	--	Insufficient data
MLS-11-1	91	372-387	1.800	Moderate	Stabilized pumping	Only 1 Test
MLS-11-2	92	352-367	0.255	Low	Stabilized pumping	Only 1 Test
MLS-11-3	93	320-335	ND	ND	--	Insufficient data
MLS-11-4	94	277-292	ND	ND	--	Insufficient data
MLS-11-5	95	244-259	ND	ND	--	Insufficient data
MLS-11-6	96	200-215	ND	ND	--	Insufficient data
MLS-11-7	97	175-190	ND	ND	--	Insufficient data
MLS-11-8	98	163-178	ND	ND	--	Insufficient data
MLS-11-9	99	153-168	240.000	High	Stabilized pumping	Only 1 Test
MLS-11-10	100	100-115	345.000	High	Stabilized pumping	Only 1 Test
MLS-11-11	101	59-74	High	High	--	Assumed to be high
MLS-12-1	102	33-38	12.195	Moderate	Pump Test	Matched to end of test flow rate of 0.65 gpm, good isolation of upper transducer zone
MLS-12-2	103	38-53	130.380	Moderate	Recovery Test	Matched to average of values, good isolation of pumping transducer zone
MLS-12-3	104	56-71	1.230	Low	Pump Test	Matched to end of test flow rate of 0.25 gpm, good isolation of pumping transducer zone
MLS-12-4	105	76-91	0.495	Low	Pump Test	Matched to end of test flow rate of 0.35 gpm, good isolation of pumping transducer zone
MLS-12-5	106	130-145	0.120	Low	Pump Test	Matched to end of test flow rate of 0.07 gpm, good isolation of pumping transducer zone
MLS-12-6	107	170-197	60.183	Moderate	Slug Test	Bottom packer was deflated to increase zone, so bottom transducer mirrors pumping transducer. Good isolation from upper transducer
MLS-13-1	108	37-60	0.949	Low	Recovery Test	Good match, Ss is 1.0E-10
MLS-13-2	109	65-80	17.595	Moderate	Recovery Test	Good isolation of pumping zone transducer. Ss is 4.6E-7
MLS-13-3	110	85-100	56.940	Moderate	Pump Test	Matched to end of test flow rate of 0.25 gpm, good isolation of pumping transducer zone
MLS-13-4	111	125-140	0.113	Low	Recovery Test	Good match at beginning point, and second day data, good isolation of pumping zone, Ss is 1.0E-10 ft
MLS-13-5	112	145-160	0.030	Low	Recovery Test	Good match along curve, Ss is 6.6E-5 ft
MLS-13-6	113	170-185	269.400	High	Pump Test	Matched to end of test flow rate of 0.95 gpm, hydraulic connection with lower zone
MLS-13-7	114	240-255	0.355	Low	Recovery Test	Good match along curve, Ss is 3.3E-6 ft
MLS-14-1	115	55-70	60.360	Moderate	Pump Test	Matched to end of test flow rate of 0.25 gpm, good isolation of pumping transducer zone
MLS-14-2	116	70-85	1.451	Low	Recovery Test	Good match, good isolation of pumping transducer zone
MLS-14-3	117	97-112	16.575	Moderate	Pump Test	Matched to flow rate of 0.3 gpm where water level stabilized near end of test, good isolation of pumping transducer zone
MLS-14-4	118	131-146	0.266	Low	Recovery Test	Good match, good isolation of pumping transducer zone
MLS-14-5	119	146-161	45.330	Moderate	Pump Test	Matched using end flow rate of 1.9 gpm. Hydraulic connection between lower and pumping zone
MLS-14-6	120	170-185	63.765	Moderate	Pump Test	Matched using end flow rate of 1.75 gpm. Hydraulic connection between upper and pumping zones.
MLS-14-7	121	201-216	0.553	Low	Recovery Test	Good match, hydraulic connection between pumping and lower zones

Notes:

1. Negligible = 0 ft/day, Low = 0-0.1 ft/day, Moderate = 0.1-10 ft/day, High = 10-100 ft/day

CDM Smith

Table 3-4
Water Level Elevation Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Screen Interval (ft bgs)		Port	Measuring Point Elevation (ft NAVD)	05/07/14		11/14/14		12/16/2015[1]		11/30/17		1/25/2018[2]	
	Top	Bottom			Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)
MLS-1	30	45	1	917.91	2.69	915.22	17.67	900.24	10.55	907.36	4.98	912.93	3.41	914.50
	80	95	2	917.96	0.77	917.19	17.49	900.47	1.95	916.01	4.39	913.57	2.72	915.24
	107	122	3	917.87	0.77	917.10	17.5	900.37	1.34	916.53	4.19	913.68	2.9	914.97
	229	244	4	917.88	6.39	911.49	23.27	894.61	8.00	909.88	10.26	907.62	6.72	911.16
	285	300	5	917.92	7.15	910.77	23.81	894.11	15.80	902.12	13.15	904.77	9.7	908.22
	342	357	6	917.87	10.34	907.53	27.11	890.76	16.53	901.34	15.05	902.82	11.83	906.04
MLS-2	35	50	1	916.78	--	--	dry	--	--	--	40.01	876.77	34.48	882.30
	55	70	2	916.77	--	--	51.7	865.07	40.89	875.88	40.64	876.13	35.66	881.11
	100	115	3	916.80	--	--	45.31	871.49	38.93	877.87	38.22	878.58	35.08	881.72
	119	134	4	916.8	--	--	45.23	871.58	--	--	38.21	878.60	35.13	881.68
	165	180	5	916.78	--	--	45.93	870.85	38.80	877.98	38.42	878.36	35.3	881.48
	340	355	6	916.79	--	--	42.51	874.28	36.35	880.44	35.18	881.61	32.36	884.43
MLS-3	65	80	1	950.26	25.21	925.05	52.08	898.18	--	--	34.23	916.03	28.62	921.64
	110	125	2	950.24	60.19	890.05	75.74	874.50	--	--	71.65	878.59	69.55	880.69
	174	189	3	950.24	64.26	885.98	75.47	874.77	--	--	71.86	878.38	68.85	881.39
	215	230	4	950.28	64.13	886.15	77.73	872.55	--	--	71.53	878.75	68.43	881.85
	240	255	5	950.30	60.71	889.59	60.69	889.61	--	--	71.39	878.91	68.32	881.98
	295	310	6	950.33	63.04	887.29	71.04	879.29	--	--	71.26	879.07	68.2	882.13
	325	340	7	950.34	63.77	886.57	77.01	873.33	--	--	71.3	879.04	68.21	882.13
MLS-4	73	88	1	957.78	--	--	59.9	897.88	42.82	914.96	41.89	915.89	36.45	921.33
	110	125	2	957.76	--	--	63.27	894.49	42.97	914.79	41.92	915.84	36.46	921.30
	200	215	3	957.74	--	--	84.88	872.86	78.76	878.98	78.7	879.04	75.6	882.14
	310	325	4	957.74	--	--	84.42	873.32	78.72	879.02	78.65	879.09	75.62	882.12
	361	376	5	957.73	--	--	84.57	873.16	77.50	880.23	78.76	878.97	75.73	882.00
	460	475	6	957.73	--	--	86.18	871.55	81.58	876.15	81.17	876.56	78.3	879.43
MLS-5	34	49	1	919.70	--	--	37.48	882.22	30.68	889.02	28.22	891.48	24.9	894.80
	75	90	2	919.69	--	--	41.04	878.65	36.16	883.53	35.45	884.24	32.21	887.48
	102	117	3	919.69	--	--	43.08	876.61	33.97	885.72	38.89	880.80	36.5	883.19
	194	209	4	919.72	--	--	37.75	881.97	34.10	885.62	31.53	888.19	28.58	891.14
	313	328	5	919.71	--	--	35.92	883.79	31.78	887.93	29.99	889.72	27.08	892.63
MLS-6	30	45	1	921.45	--	--	52.79	868.66	27.43	894.02	15.82	905.63	15.09	906.36
	50	65	2	921.44	--	--	39.3	882.14	36.26	885.18	32.45	888.99	31.19	890.25
	110	125	3	921.46	--	--	33.35	888.11	31.16	890.30	28.8	892.66	26.06	895.40
	160	175	4	921.45	--	--	33.63	887.82	27.39	894.06	27.42	894.03	24.49	896.96
	200	215	5	921.48	--	--	33.46	888.02	28.59	892.89	24.65	896.83	24.42	897.06
	235	250	6	921.5	--	--	33.46	888.05	29.76	891.75	27.54	893.97	24.42	897.09
	321	336	7	921.49	--	--	33.88	887.61	29.75	891.74	27.21	894.28	24.42	897.07
MLS-7	35	50	1	903.25	--	--	49.04	854.21	45.64	857.61	46.97	856.28	42.54	860.71
	67	82	2	903.25	--	--	49.18	854.07	41.92	861.33	46.82	856.43	42.98	860.27
	119	134	3	903.28	--	--	49.18	854.10	45.96	857.32	47.05	856.23	42.99	860.29
	270	285	4	903.26	--	--	30.37	872.89	17.60	885.66	24.44	878.82	21.41	881.85
	376	391	5	903.26	--	--	18.66	884.60	15.38	887.88	13.41	889.85	10.5	892.76
MLS-8	55	70	1	849.19	--	--	22.22	826.97	14.82	834.37	14.89	834.30	12.5	836.69
	70	85	2	849.13	--	--	22.45	826.68	16.53	832.60	15.66	833.47	13.1	836.03
	108	123	3	849.13	--	--	24.97	824.16	18.72	830.41	17.92	831.21	16.2	832.93
	205	220	4	849.10	--	--	65.41	783.69	47.61	801.49	55.71	793.39	51.91	797.19
	235	250	5	849.13	--	--	67.41	781.72	60.11	789.02	56.6	792.53	52.8	796.33
	281	296	6	849.17	--	--	67.62	781.55	61.64	787.53	56.79	792.38	52.82	796.35
MLS-9	54	69	1	788.40	--	--	32.49	755.91	30.55	757.85	26.19	762.21	25.32	763.08
	82	97	2	788.39	--	--	32.9	755.49	29.00	759.39	24.25	764.14	24.43	763.96
	100	115	3	788.38	--	--	32.48	755.90	26.98	761.40	25.91	762.47	25.44	762.94
	125	140	4	788.39	--	--	32.23	756.16	29.64	758.75	25.36	763.03	25.45	762.94
	175	190	5	788.43	--	--	35.17	753.26	26.28	762.15	28.1	760.33	29.6	758.83
	271	286	6	788.43	--	--	35.89	752.54	27.69	760.74	30.39	758.04	30.6	757.83

Table 3-4
Water Level Elevation Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Screen Interval (ft bgs)		Port	Measuring Point Elevation (ft NAVD)	05/07/14		11/14/14		12/16/2015[1]		11/30/17		1/25/2018[2]	
	Top	Bottom			Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)	Depth to Water (ft)	Elevation (ft NAVD)
MLS-11	59	74	1	709.93	--	--	2.95	706.98	2.04	707.89	1.75	708.18	1.35	708.58
	100	115	2	709.95	--	--	3.01	706.94	1.69	708.26	1.9	708.05	1.5	708.45
	119	134	3	709.95	--	--	2.9	707.05	1.28	708.67	2.04	707.91	1.65	708.30
	165	180	4	709.95	--	--	2.82	707.13	0.30	709.65	2.05	707.90	1.59	708.36
	277	292	5	709.90	--	--	3.84	706.06	1.69	708.21	3.12	706.78	2.7	707.20
	352	367	6	709.95	--	--	3.74	706.21	2.04	707.91	2.94	707.01	2.65	707.30
MLS-13	40	55	1	813.40	--	--	--	--	--	--	21.1	792.30	20.49	792.91
	65	80	2	813.40	--	--	--	--	--	--	26.15	787.25	25.6	787.80
	85	100	3	813.40	--	--	--	--	--	--	25.97	787.43	25.79	787.61
	170	185	4	813.35	--	--	--	--	--	--	41.12	772.23	40	773.35
	240	270	5	813.35	--	--	--	--	--	--	41.92	771.43	40.47	772.88
MLS-14	55	70	1	715.78	--	--	--	--	--	--	7.76	708.02	7.32	708.46
	97	112	2	715.78	--	--	--	--	--	--	7.82	707.96	7.4	708.38
	146	161	3	715.78	--	--	--	--	--	--	7.96	707.82	7.65	708.13
	170	185	4	715.78	--	--	--	--	--	--	8.08	707.70	7.67	708.11
MW-1	34	100	--	918.44	13.26	905.18	32.98	885.46	27.35	891.09	--	--	11.24	907.20
MW-2	20	100	--	922.44	16.64	905.80	19.31	903.13	--	--	--	--	3.35	919.09
MW-3	20	100	--	922	5.70	916.61	33.53	888.78	15.40	906.91	11.32	910.99	5.96	916.35
MW-4	10	20.0	--	920.12	7.31	912.81	21.63	898.49	18.45	901.67	11.04	909.08	8.03	912.09
MW-5	5	10.0	--	917.53	3.19	914.34	dry	--	11.70	905.83	5.7	911.83	3.55	913.98
MW-6	10	20.0	--	919.44	6.23	913.21	21.21	898.23	17.79	901.65	10.02	909.42	6.78	912.66
MW-7	3	13.0	--	709.63	--	--	--	--	1.82	707.81	1.1	708.53	0.64	708.99
MW-8	4.8	14.0	--	710.58	--	--	--	--	4.10	706.48	3.85	706.73	3.3	707.28
MW-9	40	50.0	--	773.06	--	--	--	--	22.66	750.40	18.42	754.64	18.05	755.01
MW-10	13	50.0	--	797.59	--	--	--	--	19.80	777.79	17.02	780.57	15.51	782.08
MW-11	29	38.5	--	710.29	--	--	--	--	2.38	707.91	2.03	708.26	1.6	708.69
MW-12	5	14.8	--	775.17	--	--	--	--	8.48	766.69	8.21	766.96	6.59	768.58
MW-13	8.5	18.5	--	752.80	--	--	--	--	8.32	744.48	8.14	744.66	7.05	745.75
MW-14	4	14.0	--	711.5	--	--	--	--	1.82	709.69	2.35	709.16	2.19	709.32
MW-15B	85	100	--	879.0	--	--	--	--	--	--	2.65	876.38	2.08	876.95
MW-16	185	200	--	922.6	--	--	--	--	--	--	13.58	908.99	7.14	915.43
PZ-1[1]	0.35	2.35	--	710.60	--	--	--	--	1.32	709.28	0.8	709.80	0.42	710.18
	0.35	2.35	--	710.60	--	--	--	--	1.41	709.19	--	--	--	--
PZ-2[1]	0.2	2.2	--	709.6	--	--	--	--	1.84	707.77	1.23	708.38	0.6	709.008
	0.2	2.2	--	709.6	--	--	--	--	1.83	707.78	--	--	--	--
PZ-3[1]	0.4	2.4	--	708.39	--	--	--	--	1.53	706.86	1.63	706.76	1	707.388
	0.4	2.4	--	708.39	--	--	--	--	1.51	706.88	--	--	--	--
PZ-4[1]	1.14	3.14	--	725.03	--	--	--	--	--	--	0.37	724.66	0.35	724.68
	1.14	3.14	--	725.03	--	--	--	--	--	--	--	--	--	--
OPZ-1	0.92	1.92	--	715.22	--	--	--	--	--	--	4.55	710.67	4.5	710.72
OPZ-4	0.61	2.61	--	729.49	--	--	--	--	--	--	5.2	724.29	4.76	724.73

Notes:

1. First measurement in 2015 represents the overburden, the second measurement represents the surface water.

2. January 25, 2018 event collected after period of rain and snowmelt

Acronyms:

bgs- below ground surface

ft - feet

ID - identification

NGVD - National Geodetic Vertical Datum

NAVD - North American Vertical Datum of 1988

Table 3-5
Mansfield Precipitation Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample Round	Date	COOP Station 280734 Precipitation (inches)	COOP Station 288644 Precipitation (inches)	Notes
Historical (2014)	10/27/2014	0.0	0.0	
	10/28/2014	0.0	0.0	
	10/29/2014	0.0	0.0	
	10/30/2014	0.08	0.09	
	10/31/2014	0.0	0.0	
	11/1/2014	0.07	0.04	
	11/2/2014	0.15	0.04	
	11/3/2014	0.0	0.0	
	11/4/2014	0.0	0.0	
	11/5/2014	0.0	0.0	
	11/6/2014	0.17	0.06	
	11/7/2014	0.18	0.13	
	11/8/2014	0.0	0.0	Start of sampling
	11/9/2014	0.0	0.0	
	11/10/2014	0.0	0.0	
	11/11/2014	0.0	0.0	
	11/12/2014	0.0	0.0	
	11/13/2014	0.0	0.0	
	11/14/2014	0.19	0.21	Synoptic water level measurements collected
	11/15/2014	0.0	0.0	
	Sum	**0.84**	**0.57**	
Historical (2015)	11/24/2015	0.0	0.0	
	11/25/2015	0.0	0.0	
	11/26/2015	0.0	0.0	
	11/27/2015	0.0	0.0	
	11/28/2015	0.0	0.0	
	11/29/2015	0.01	0.04	
	11/30/2015	0.0	0.0	
	12/1/2015	0.28	0.18	Synoptic water level measurements collected
	Sum	**0.29**	**0.22**	
Round 2	10/23/2017	0.0	0.0	
	10/24/2017	0.0	0.10	
	10/25/2017	0.89	0.40	
	10/26/2017	0.0	0.0	
	10/27/2017	0.0	0.0	
	10/28/2017	0.0	0.0	
	10/29/2017	0.0	0.0	
	10/30/2017	1.92	3.80	
	10/31/2017	0.03	0.0	Start of sampling
	11/1/2017	0.0	0.0	
	11/2/2017	0.04	0.04	
	11/3/2017	0.0	0.0	
	11/4/2017	0.0	0.0	
	11/5/2017	0.09	0.04	
	11/6/2017	0.0	0.03	
	11/7/2017	0.12	0.02	
	11/8/2017	0.24	0.19	
	11/9/2017	0.0	0.0	
	11/10/2017	0.09	0.07	
	11/11/2017	0.0	0.0	
	11/12/2017	0.0	0.0	
	11/13/2017	0.06	0.0	
	11/14/2017	0.09	0.10	
	11/15/2017	0.0	0.0	
	11/16/2017	0.12	0.14	
	11/17/2017	0.06	0.06	
	11/18/2017	0.0	0.0	
	11/19/2017	0.47	0.38	
	11/20/2017	0.0	0.0	
	11/21/2017	0.0	0.0	
	11/22/2017	0.0	0.0	
	11/23/2017	0.0	0.03	
	11/24/2017	0.0	0.0	
	11/25/2017	0.0	0.0	
	11/26/2017	0.0	0.03	
	11/27/2017	0.0	0.0	
	11/28/2017	0.0	0.0	
	11/29/2017	0.0	0.0	
	11/30/2017	0.0	0.0	Synoptic water level measurements collected
	Sum	**4.22**	**5.43**	

Table 3-5
Mansfield Precipitation Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Sample Round	Date	COOP Station 280734 Precipitation (inches)	COOP Station 288644 Precipitation (inches)	Notes
Round 3	1/2/2018	0.0	0.0	
	1/3/2018	0.0	0.0	
	1/4/2018	0.01	0.0	
	1/5/2018	0.05	0.23	3.0 inches of snow
	1/6/2018	0.0	0.0	
	1/7/2018	0.0	0.0	
	1/8/2018	0.0	0.0	
	1/9/2018	0.05	0.0	
	1/10/2018	0.0	0.0	Start of sampling
	1/11/2018	0.0	0.0	
	1/12/2018	0.05	0.03	
	1/13/2018	1.73	1.75	
	1/14/2018	0.0	0.0	
	1/15/2018	0.0	0.0	
	1/16/2018	0.0	0.0	
	1/17/2018	0.27	0.49	5.4 inches of snow
	1/18/2018	0.0	0.04	0.9 inches of snow
	1/19/2018	0.0	0.0	
	1/20/2018	0.0	0.0	
	1/21/2018	0.0	0.0	
	1/22/2018	0.0	0.02	
	1/23/2018	0.39	0.44	
	1/24/2018	0.42	0.49	
	1/25/2018	0.0	0.0	Synoptic water level measurements collected
	Sum	**3.0**	**3.5**	

Source:

NOAA National Centers for Environmental Information, 2018a. 2001-2017 Annual Summaries January-December, COOP: 280734, Belvidete Bridge, NJ, US. Downloaded March 2018.

NOAA National Centers for Environmental Information, 2018b. 2007-2017 Annual Summaries January-December, COOP: 288644, Sussex 2 NW, NJ, US. Downloaded March 2018.

Table 3-6a
Vertical Gradient Calculations
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Ground Elevation (ft NAVD)	Port	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Ground Elevation Difference (ft)	Midpoint of Screen (ft bgs)	Midpoint of Screen (ft NAVD)	Measuring Point Elevation (ft NAVD)	Depth to Water (ft)	Water Elevation (ft NAVD)	Vertical Gradient (feet/ft)	Depth Zones	Site Area
Monitoring Wells (1/25/18)													
MW-5	914.41	--	5	10	0.57	7.5	906.91	917.53	3.55	913.98	0.02	Shallow	Source Area
MLS-1	914.98	1	30	45		37.5	877.48	917.91	3.41	914.50		--	Source Area
MW-4	917.44	--	10	20	1.51	15	902.44	920.12	8.03	912.09	-0.27	Shallow	Source Area
MLS-6	918.95	1	30	45		37.5	881.45	921.45	15.09	906.36		--	Source Area
MLS-1	914.98	2	80	95	0.00	87.5	827.48	917.96	2.72	915.24	-0.03	Shallow	Source Area
MLS-1	914.98	4	229	244		236.5	678.48	917.88	6.72	911.16		Intermediate	Source Area
MLS-2	914.88	3	100	115	0.00	107.5	807.38	916.80	35.08	881.72	0.00	Shallow	Source Area
MLS-2	914.88	5	165	180		172.5	742.38	916.78	35.3	881.48		Intermediate	Source Area
MLS-3	948.56	2	110	125	0.00	117.5	831.06	950.24	69.55	880.69	0.01	Shallow	Source Area
MLS-3	948.56	5	240	255		247.5	701.06	950.30	68.32	881.98		Intermediate	Source Area
MLS-5	917.86	2	75	90	0.00	82.5	835.36	919.69	32.21	887.48	0.03	Shallow	Source Area
MLS-5	917.86	4	194	209		201.5	716.36	919.72	28.58	891.14		Intermediate	Source Area
MLS-6	918.95	3	110	125	0.00	117.5	801.45	921.46	26.06	895.40	0.01	Shallow	Source Area
MLS-6	918.95	6	235	250		242.5	676.45	921.50	24.42	897.08		Intermediate	Source Area
MLS-7	901.73	2	67	82	0.00	74.5	827.23	903.25	42.98	860.27	0.11	Shallow	Source Area
MLS-7	901.73	4	270	285		277.5	624.23	903.26	21.41	881.85		Intermediate	Source Area
MLS-4	955.77	1	73	88	0.00	80.5	875.27	957.78	36.45	921.33	-0.17	--	Source Area
MLS-4	955.77	4	310	325		317.5	638.27	957.74	75.62	882.12		Intermediate	Source Area
MLS-1	914.98	4	229	244	0.00	236.5	678.48	917.88	6.72	911.16	-0.05	Intermediate	Source Area
MLS-1	914.98	6	342	357		349.5	565.48	917.87	11.83	906.04		Deep	Source Area
MLS-2	914.88	5	165	180	0.00	172.5	742.38	916.78	35.3	881.48	0.02	Intermediate	Source Area
MLS-2	914.88	6	340	355		347.5	567.38	916.79	32.36	884.43		Deep	Source Area
MLS-3	948.56	5	240	255	0.00	247.5	701.06	950.30	68.32	881.98	0.00	Intermediate	Source Area
MLS-3	948.56	7	325	340		332.5	616.06	950.34	68.21	882.13		Deep	Source Area
MLS-4	955.77	4	310	325	0.00	317.5	638.27	957.74	75.62	882.12	0.00	Intermediate	Source Area
MLS-4	955.77	5	361	376		368.5	587.27	957.73	75.73	882.00		Deep	Source Area
MLS-5	917.86	4	194	209	0.00	201.5	716.36	919.72	28.58	891.14	0.01	Intermediate	Source Area
MLS-5	917.86	5	313	328		320.5	597.36	919.71	27.08	892.63		Deep	Source Area
MLS-6	918.95	6	235	250	0.00	242.5	676.45	921.50	24.42	897.08	0.00	Intermediate	Source Area
MLS-6	918.95	7	321	336		328.5	590.45	921.49	24.42	897.07		Deep	Source Area
MLS-7	901.73	4	270	285	0.00	277.5	624.23	903.26	21.41	881.85	0.10	Intermediate	Source Area
MLS-7	901.73	5	376	391		383.5	518.23	903.26	10.5	892.76		Deep	Source Area
MLS-8	850.25	1	55	70	0.00	62.5	787.75	849.19	12.5	836.69	-0.26	Shallow	Residental Area
MLS-8	850.25	4	205	220		212.5	637.75	849.10	51.91	797.19		Intermediate	Residental Area
MLS-8	850.25	4	205	220	0.00	212.5	637.75	849.10	51.91	797.19	-0.01	Intermediate	Residental Area
MLS-8	850.25	6	281	296		288.5	561.75	849.17	52.82	796.35		Deep	Residental Area
MLS-9	789.74	3	100	115	0.00	107.5	682.24	788.38	25.44	762.94	-0.03	Intermediate	Residental Area
MLS-9	789.74	6	271	286		278.5	511.24	788.43	30.6	757.83		Deep	Residental Area
MLS-13	750.66	3	85	100	0.00	92.5	658.16	813.40	25.79	787.61	-0.09	Intermediate	Residental Area
MLS-13	750.66	5	240	270		255	495.66	813.35	40.47	772.88		Deep	Residental Area
OPZ-1	710.95	--	0.92	1.92	2.22	1.42	709.53	715.22	4.5	710.72	-0.25	--	Cowboy Creek
PZ-1	708.73	--	0.35	2.35		1.35	707.38	710.60	0.42	710.18		--	Cowboy Creek
OPZ-4	725.15	--	0.61	2.61	0.93	1.61	723.54	729.49	4.76	724.73	-0.03	--	Cowboy Creek
PZ-4	724.22	--	1.14	3.14		2.14	722.08	725.03	0.35	724.68		--	Cowboy Creek
MW-14	709.40	--	4	14	1.15	9	700.40	711.50	2.19	709.31	-0.03	Intermediate	Cowboy Creek
MW-11	710.55	--	29	38.5		33.75	676.80	710.29	1.6	708.69		Intermediate	Cowboy Creek
MLS-11	710.90	1	59	74	0.00	66.5	644.40	709.93	1.35	708.58	0.00	--	Cowboy Creek
MLS-11	710.90	4	165	180		172.5	538.40	709.95	1.59	708.36		Deep	Cowboy Creek
MLS-14	712.56	1	55	70	0.00	62.5	650.06	715.78	7.32	708.46	0.00	--	Cowboy Creek
MLS-14	712.56	3	146	161		153.5	559.06	715.78	7.65	708.13		Deep	Cowboy Creek

Table 3-6a
Vertical Gradient Calculations
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Well ID	Ground Elevation (ft NAVD)	Port	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Ground Elevation Difference (ft)	Midpoint of Screen (ft bgs)	Midpoint of Screen (ft NAVD)	Measuring Point Elevation (ft NAVD)	Depth to Water (ft)	Water Elevation (ft NAVD)	Vertical Gradient (feet/ft)	Depth Zones	Site Area
Monitoring Wells (12/16/15)													
PZ-1 O	708.73	--	0.35	2.35	1.35	0.00	707.38	709.28	1.32	1.03	--	--	Cowboy Creek
PZ-1 S	708.73	--	0.35	2.35	1.35		707.38	709.19	1.41	0.94		--	Cowboy Creek
PZ-2 O	707.42	--	0.2	2.2	1.2	0.00	706.22	707.77	1.84	0.36	--	--	Cowboy Creek
PZ-2 S	707.42	--	0.2	2.2	1.2		706.22	707.78	1.83	0.37		--	Cowboy Creek
PZ-3 O	706.44	--	0.4	2.4	1.4	0.00	705.04	706.86	1.53	0.87	--	--	Cowboy Creek
PZ-3 S	706.44	--	0.4	2.4	1.4		705.04	706.88	1.51	0.89		--	Cowboy Creek

Notes:

bgs- below ground surface

ft - feet

NAVD - North American Vertical Datum

O - Overburden

S - Surface water

Table 3-6b
Horizontal Gradient Calculations
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Flow Line	Well ID	Port	Measuring Point Elevation (ft NGVD)	Depth to Water (ft)	Water Elevation (ft NGVD)	Aquifer	Water Elevation Averaged by Aquifer (ft NGVD)	Distance (ft)	Gradient (ft)
Shallow Overburden	MW-13	--	753.49	8.32	745.17	OB	745.17	972	0.038
	PZ-2	--	710.3	1.84	708.46	OB	708.46		
Shallow Bedrock	MLS-6	1	922.14	27.43	894.71	SBR	890.29	995	0.132
		2	922.13	36.26	885.87				
	MLS-9	1	789.09	30.55	758.54	SBR	759.31		
		2	789.08	29.00	760.08				
Intermediate Bedrock	MLS-1	2	918.65	1.95	916.7	IBR	916.96	990	0.157
		3	918.56	1.34	917.22				
	MLS-9	3	789.07	26.98	762.09	IBR	761.46		
		4	789.08	29.64	759.44				
		5	789.12	26.28	762.84				
Deep Bedrock	MLS-6	6	922.2	29.76	892.44	DBR	892.44	995	0.132
		7	922.18	29.75	892.43				
	MLS-9	6	789.12	27.69	761.43	DBR	761.43		

Notes:
Water level measurements from 2/15/16 synoptic water level round.
ft NAVD = elevation (feet) - North American Vertical Datum ft bgs - Feet below ground surface
Vertical Measurements are relative to NAVD-1988
Aquifers: shallow bedrock (SBR) = up to 50 feet below bedrock surface, intermediate bedrock (IBR) = 50-200 feet below bedrock surface, deep bedrock (DBR) = more than 200 fet below bedrock surface. OB = overburden, SW = surface water
NGVD - National Geodetic Vertical Datum

Table 4-1a
Groundwater and Surface Water Screening Criteria - VOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
1,1,1-Trichloroethane	71-55-6	30	200	30	NL	8,000	30	76	11	NL	76	120	NL	120	76
1,1,2,2-Tetrachloroethane	79-34-5	1	NL	1	NL	0.08	1	380	610	NL	380	5	0.17	0.17	0.17
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	NL	20,000	NL	10,000	20,000	NL	NL	NL	NL	NL	NL	NL	NL
1,1,2-Trichloroethane	79-00-5	3	5	3	NL	0.28	3	500	1,200	NL	500	13	1	1	1
1,1-Dichloroethane	75-34-3	50	NL	50	NL	2.8	50	NL	47	NL	47	NL	NL	NL	47
1,1-Dichloroethene	75-35-4	2	7	1	NL	280	1	65	25	NL	65	5	330	5	5
1,2,3-Trichlorobenzene	87-61-6	NL	NL	NL	NL	7	7	NL	8	NL	8	NL	NL	NL	8
1,2,4-Trichlorobenzene	120-82-1	9	70	9	NL	1.2	9	30	24	NL	30	21	35	21	21
1,2-Dibromo-3-chloropropane	96-12-8	0.2	0.2	0.02	NL	0.00033	0.02	NL	NL	NL	NL	NL	NL	NL	NL
1,2-Dibromoethane	106-93-4	0.05	0.05	0.03	NL	0.01	0.03	NL	NL	NL	NL	NL	NL	NL	NL
1,2-Dichlorobenzene	95-50-1	600	600	600	NL	300	600	14	0.7	NL	14	2,000	420	420	14
1,2-Dichloroethane	107-06-2	2	5	2	NL	0.17	2	910	100	NL	910	0.29	0.38	0.29	0.29
1,2-Dichloropropane	78-87-5	5	5	1	NL	0.85	1	360	NL	NL	360	0.5	0.5	0.5	0.5
1,3-Dichlorobenzene	541-73-1	600	NL	600	NL	NL	600	38	150	NL	38	2,200	320	320	38
1,4-Dichlorobenzene	106-46-7	75	75	75	NL	0.48	75	9.4	26	NL	9.4	550	63	63	9
2-Butanone	78-93-3	NL	NL	300	NL	5,600	300	NL	14,000	NL	14,000	NL	NL	NL	14,000
2-Hexanone	591-78-6	NL	NL	40	NL	38	40	NL	99	NL	99	NL	NL	NL	99
4-Methyl-2-pentanone	108-10-1	NL	NL	NL	NL	6,300	6,300	NL	170	NL	170	NL	NL	NL	170
Acetone	67-64-1	NL	NL	6,000	NL	14,000	6,000	NL	1,500	NL	1,500	NL	NL	NL	1,500
Benzene	71-43-2	1	5	1	NL	0.46	1	114	370	NL	114	0.15	2.2	0.15	0.15
Bromochloromethane	74-97-5	NL	NL	NL	NL	83	83	NL	NL	NL	NL	NL	NL	NL	NL
Bromodichloromethane	75-27-4	80	80	1	NL	0.13	1	NL	NL	NL	NL	0.55	0.55	1	0.55
Bromoform	75-25-2	80	80	4	NL	3.3	4	230	320	NL	230	4.3	4.30	4.3	4.3
Bromomethane	74-83-9	NL	NL	10	NL	7.5	10	16	NL	NL	16	47	47	47	16
Carbon Disulfide	75-15-0	NL	NL	700	NL	810	700	NL	1	NL	0.92	NL	NL	NL	0.92
Carbon Tetrachloride	56-23-5	2	5.00	1	NL	0.46	1	240	13	NL	240	0.33	0.23	0.23	0.23
Chlorobenzene	108-90-7	50	100	50	NL	78	50	47	1.3	NL	47	210	130	130	47
Chloroethane	75-00-3	NL	NL	NL	5	21,000	5	NL	NL	NL	NL	NL	NL	NL	NL
Chloroform	67-66-3	80	80	70	NL	0.22	70	140	1.8	NL	140	68	5.7	5.7	5.7
Chloromethane	74-87-3	NL	NL	NL	NL	190	190	NL	NL	NL	NL	NL	NL	NL	NL
cis-1,2-Dichloroethene	156-59-2	70	70	70	NL	36	70	NL	NL	NL	NL	NL	NL	NL	NL
cis-1,3-Dichloropropene	10061-01-5	NL	NL	1	NL	NL	1	NL	0.055	NL	0.055	0.34	0.34	0.34	0.06
Cyclohexane	110-82-7	NL	NL	NL	NL	13,000	13,000	NL	NL	NL	NL	NL	NL	NL	NL
Dibromochloromethane	124-48-1	80	80	1	NL	0.87	1	NL	NL	NL	NL	0.40	0.40	0.4	0.40
Dichlorodifluoromethane	75-71-8	NL	NL	1,000	NL	200	1,000	NL	NL	NL	NL	NL	NL	NL	NL
Ethylbenzene	100-41-4	700	700	700	NL	1.5	700	14	90	NL	14	530	530	530	14
Isopropylbenzene	98-82-8	NL	NL	700	NL	450	700	NL	3	NL	2.6	NL	NL	NL	3
m,p-Xylene*	108-38-3	1,000	10,000	1,000	NL	190	1,000	27	13	13	27	NL	NL	NL	27
Methyl Acetate	79-20-9	NL	NL	7,000	NL	20,000	7,000	NL	NL	NL	NL	NL	NL	NL	NL
Methyl tert-Butyl Ether	1634-04-4	70	NL	70	NL	14	70	51000	11,070	NL	51,000	70	NL	70	70
Methylcyclohexane	108-87-2	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	NL	NL	NL
Methylene Chloride	75-09-2	3	5	3	NL	11	3	940	98	NL	940	2.50	4.60	3	3
o-Xylene**	95-47-6	1,000	10,000	1,000	NL	190	1,000	27	13	13	27	NL	NL	NL	27
Styrene	100-42-5	100	100	100	NL	1,200	100	32	72	NL	32	NL	NL	NL	32
Tetrachloroethene	127-18-4	1	5	1	NL	11	1	45	111	NL	45	0.34	0.69	0.34	0.34

Table 4-1a
Groundwater and Surface Water Screening Criteria - VOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
Toluene	108-88-3	1,000	1,000	600	NL	1,100	600	253	2	NL	253	1,300	1,300	1,300	253
trans-1,2-Dichloroethene	156-60-5	100	100	100	NL	360	100	970	970	NL	970	590	140	140	140
trans-1,3-Dichloropropene	10061-02-6	NL	NL	1	NL	NL	1	NL	0.055	NL	0.055	0.34	0.34	0.34	0.06
Trichloroethene	79-01-6	1	5	1	NL	0.49	1	47	21	NL	47	1.00	2.50	1	1
Trichlorofluoromethane	75-69-4	NL	NL	2,000	NL	5,200	2,000	NL	NL	NL	NL	NL	NL	NL	NL
Vinyl Chloride	75-01-4	2	2	1	NL	0.02	1	930	930	NL	930	0.08	0.03	0.025	0.025
Xylenes (Total)	1330-20-7	1,000	10,000	1,000	NL	190	1,000	27	13	NL	27	NL	NL	NL	27

Notes:
1. Groundwater criteria were selected in a hierarchical fashion as follows:
(a) Lowest of the following:
(a-1) New Jersey Drinking Water Standards, February 10, 2009 (http://www.nj.gov/dep/standards/drinking%20water.pdf), downloaded May 13, 2017.
(a-2) EPA National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009. (https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf)
(a-3) New Jersey Ground Water Quality Standards Class IIA (N.J.A.C. 7:9C), January 2018. (http://www.nj.gov/dep/wms/bears/Appendix_Table_1.htm#/; downloaded 1/23/18)
(a-4) New Jersey Ground Water Quality Standard (N.J.A.C 7:9C), January 2018. (Interim Generic standard as listed in http://www.nj.gov/dep/standards/ground%20water.pdf; downloaded 1/25/18)
Synthetic organic chemicals lacking specific or interim specific criteria were assigned an interim generic standard value based on N.J.A.C. 7:9C: Appendix Table II.
(b) EPA Human health-based screening – RSL Tapwater (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected.
(http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
2. Surface Water criteria were selected from the lowest of:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Surface Water Quality Standards: Ecological Screening Criteria (Chronic), March 10, 2009
Accessed December 2017 (http://www.nj.gov/dep/srp/guidance/ecoscreening/, http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(a-2) EPA Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks, July 2006
https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf
(a-3) EPA National Recommended Aquatic Life Criteria table based on Freshwater CCC (chronic) values,
Accessed May 2017 (http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm)
(b) Human health screening criteria which were selected from the lowest of the following:
(b-1) NJDEP Surface Water Quality Standards: Human Health Criteria, October 2016
(http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(b-2) EPA National Recommended Water Quality Criteria, Human Health for the consumption of water and organism
Accessed May 2017 (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)

*Xylene (total) was used for m,p-xylene criteria.
** Xylene (total) was used for o-xylene criteria.
CCC - criterion continuous concentration
µg/L - microgram per liter
NJDEP - New Jersey Department of Environmental Protection
NJ MCL - New Jersey Maximum Contaminant Level
NJ GWQC - New Jersey Groundwater Quality Criteria
NL - not listed
N/A - not applicable
RSL - regional screening level
VOC - volatile organic compound

Table 4-1b
Groundwater and Surface Water Screening Criteria - SVOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
1,1'-Biphenyl	92-52-4	NL	NL	400	NL	0.83	400	NL	14	NL	14	NL	NL	NL	14
1,4-Dioxane	123-91-1	NL	NL	0.4	NL	0.46	0.4	NL	NL	NL	NL	NL	NL	NL	22,000[3]
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	NL	NL	NL	1.7	1.7	3	3	NL	3	0.97	0.97	0.97	0.97
2,2'-oxybis(1-Chloropropane)	108-60-1	NL	NL	300	NL	710	300	NL	NL	NL	NL	1,400	1,400	1,400	1,400
2,3,4,6-Tetrachlorophenol	58-90-2	NL	NL	200	NL	240	200	NL	1.2	NL	1.2	NL	NL	NL	1.2
2,4,5-Trichlorophenol	95-95-4	NL	NL	700	NL	1,200	700	NL	NL	NL	NL	1,800	1,800	1,800	1,800
2,4,6-Trichlorophenol	88-06-2	NL	NL	20	NL	4.1	20	4.9	5	NL	4.9	0.58	1.40	0.58	0.58
2,4-Dichlorophenol	120-83-2	NL	NL	20	NL	46	20	11	11	NL	11	77	77	77	11
2,4-Dimethylphenol	105-67-9	NL	NL	100	NL	360	100	100	NL	NL	100	380	380	380	100
2,4-Dinitrophenol	51-28-5	NL	NL	40	NL	39	40	19	NL	NL	19	69	69	69	19
2,4-Dinitrotoluene	121-14-2	NL	NL	NL	NL	0.24	0.24	44	44	NL	44	0.11	0.11	0.11	0.11
2,6-Dinitrotoluene	606-20-2	NL	NL	NL	NL	0.049	0.049	NL	81	NL	81	NL	NL	NL	81
2-Chloronaphthalene	91-58-7	NL	NL	600	NL	750	600	0.396	NL	NL	0.396	1,000	1,000	1,000	0.396
2-Chlorophenol	95-57-8	NL	NL	40	NL	91	40	24	24	NL	24	81	81	81	24
2-Methylnaphthalene	91-57-6	NL	NL	30	NL	36	30	330	5	NL	330	NL	NL	NL	330
2-Methylphenol	95-48-7	NL	NL	50	NL	930	50	NL	13	NL	13	NL	NL	NL	13
2-Nitroaniline	88-74-4	NL	NL	NL	NL	190	190	NL	NL	NL	NL	NL	NL	NL	NL
2-Nitrophenol	88-75-5	NL	NL	NL	100	NL	100	NL	1,920	NL	1,920	NL	NL	NL	1,920
3,3'-Dichlorobenzidine	91-94-1	NL	NL	30	NL	0.13	30	4.5	4.50	NL	4.5	0.021	0.021	0.021	0.021
3-Methylphenol	108-39-4	NL	NL	50	NL	930	50	NL	NL	NL	NL	NL	NL	NL	NL
3-Nitroaniline	99-09-2	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	NL	NL	NL
4,6-Dinitro-2-methylphenol	534-52-1	NL	NL	0.7	NL	1.5	0.7	NL	NL	NL	NL	13	13	13	13
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	100	NL	100	NL	1.50	NL	1.5	NL	NL	NL	1.5
4-Chloro-3-methylphenol	59-50-7	NL	NL	NL	100	1,400	100	NL	NL	NL	NL	NL	NL	NL	NL
4-Chloroaniline	106-47-8	NL	NL	30	NL	0.37	30	NL	232	NL	232	NL	NL	NL	232
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	NL	NL	NL
4-Methylphenol	106-44-5	NL	NL	50	NL	1,900	50	NL	543	NL	543	NL	NL	NL	543
4-Nitroaniline	100-01-6	NL	NL	NL	NL	3.8	3.8	NL	NL	NL	NL	NL	NL	NL	NL
4-Nitrophenol	100-02-7	NL	NL	NL	100	NL	100	60	60	NL	60	NL	NL	NL	60
Acenaphthene	83-32-9	NL	NL	400	NL	530	400	38	6	NL	38	670	670	670	38
Acenaphthylene	208-96-8	NL	NL	NL	100	NL	100	4840	NL	NL	4,840	NL	NL	NL	4,840
Acetophenone	98-86-2	NL	NL	700	NL	1,900	700	NL	NL	NL	NL	NL	NL	NL	NL
Anthracene	120-12-7	NL	NL	2,000	NL	1,800	2,000	0.035	0.01	NL	0.035	8,300	8,300	8,300	0.035
Atrazine	1912-24-9	3	3	3	NL	0.3	3	NL	1.80	NL	1.8	NL	NL	NL	1.8
Benzaldehyde	100-52-7	NL	NL	NL	NL	19	19	NL	NL	NL	NL	NL	NL	NL	NL
Benzo(a)anthracene	56-55-3	NL	NL	0.1	NL	0.03	0.1	0.025	0.018	NL	0.025	0.038	0.0038	0.0038	0.0038
Benzo(a)pyrene	50-32-8	0.2	0.2	0.1	NL	0.025	0.1	0.014	0.015	NL	0.014	0.0038	0.0038	0.0038	0.0038
Benzo(b)fluoranthene	205-99-2	NL	NL	0.2	NL	0.25	0.2	9.07	NL	NL	9.07	0.038	0.0038	0.0038	0.0038
Benzo(g,h,i)perylene	191-24-2	NL	NL	NL	100	NL	100	7.64	NL	NL	7.64	NL	NL	NL	7.64
Benzo(k)fluoranthene	207-08-9	NL	NL	0.5	NL	2.5	0.5	NL	NL	NL	NL	0.38	0.0038	0.0038	0.0038
bis(2-Chloroethoxy) methane	111-91-1	NL	NL	NL	NL	59	59	NL	NL	NL	NL	NL	NL	NL	NL
bis(2-Chloroethyl) ether	111-44-4	NL	NL	7	NL	0.014	7	1900	NL	NL	1,900	0.03	0.03	0.03	0.03
bis-(2-Ethylhexyl)phthalate	117-81-7	6	6	3	NL	5.6	3	0.3	16	NL	0.3	1.20	1.20	1.2	0.3
Butylbenzylphthalate	85-68-7	NL	NL	100	NL	16	100	23	19	NL	23	150	1,500	150	23
Caprolactam	105-60-2	NL	NL	4,000	NL	9,900	4,000	NL	NL	NL	NL	NL	NL	NL	NL
Carbazole	86-74-8	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	NL	NL	NL
Chrysene	218-01-9	NL	NL	5	NL	25	5	NL	NL	NL	NL	3.80	0.0038	0.0038	0.0038
Dibenzo(a,h)anthracene	53-70-3	NL	NL	0.3	NL	0.025	0.3	NL	NL	NL	NL	0.0038	0.0038	0.0038	0.0038
Dibenzofuran	132-64-9	NL	NL	NL	NL	7.9	7.9	NL	3.70	NL	3.7	NL	NL	NL	3.7
Diethylphthalate	84-66-2	NL	NL	6,000	NL	15,000	6,000	110	210	NL	110	17,000	17,000	17,000	110
Dimethylphthalate	131-11-3	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	270,000	270,000	270,000
Di-n-butylphthalate	84-74-2	NL	NL	700	NL	900	700	9.7	19	NL	9.7	2,000	2,000	2,000	9.7
Di-n-octylphthalate	117-84-0	NL	NL	100	NL	200	100	NL	22	NL	22	NL	NL	NL	22
Fluoranthene	206-44-0	NL	NL	300	NL	800	300	1.9	0.04	NL	1.9	130	130	130	1.9

Table 4-1b
Groundwater and Surface Water Screening Criteria - SVOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
Fluorene	86-73-7	NL	NL	300	NL	290	300	19	3	NL	19	1,100	1,100	1,100	19
Hexachlorobenzene	118-74-1	1	1	0.02	NL	0.0098	0.02	0.0003	0.0003	NL	0.0003	0.00028	0.00028	0.00028	0.00028
Hexachlorobutadiene	87-68-3	NL	NL	1	NL	0.14	1	0.053	1.30	NL	0.053	0.44	0.44	0.44	0.053
Hexachlorocyclopentadiene	77-47-4	50	50	40	NL	0.41	40	77	NL	NL	77	40	40	40	40
Hexachloroethane	67-72-1	NL	NL	7	NL	0.33	7	8	12	NL	8	1.4	1.4	1.4	1.4
Indeno(1,2,3-cd)pyrene	193-39-5	NL	NL	0.2	NL	0.25	0.2	4.31	NL	NL	4.31	0.038	0.0038	0.0038	0.0038
Isophorone	78-59-1	NL	NL	40	NL	78	40	920	NL	NL	920	35	35	35	35
Naphthalene	91-20-3	300	NL	300	NL	0.17	300	13	1	NL	13	NL	NL	NL	13
Nitrobenzene	98-95-3	NL	NL	6	NL	0.14	6	220	NL	NL	220	17	17	17	17
N-Nitroso-di-n-propylamine	86-30-6	NL	NL	10	NL	12	10	NL	210	NL	210	3	3	3.3	3.3
N-Nitrosodiphenylamine	621-64-7	NL	NL	10	NL	0.011	10	NL	NL	NL	NL	0.005	0.005	0.005	0.005
Pentachlorophenol	87-86-5	1	1	0.3	NL	0.041	0.3	NL	0.5	15	0.5	0.27	0.27	0.27	0.27
Phenanthrene	85-01-8	NL	NL	NL	100	NL	100	3.6	0.40	NL	3.6	NL	NL	0	0.0
Phenol	108-95-2	NL	NL	2,000	NL	5,800	2,000	180	4	NL	180	10,000	10,000	10,000	180
Pyrene	129-00-0	NL	NL	200	NL	120	200	0.3	0.03	NL	0.3	830	830	830	0.3

Notes:
1. Groundwater criteria were selected in a hierarchical fashion as follows:
(a) Lowest of the following:
(a-1) New Jersey Drinking Water Standards, February 10, 2009 (http://www.nj.gov/dep/standards/drinking%20water.pdf), downloaded May 13, 2017.
(a-2) EPA National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009. (https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf)
(a-3) New Jersey Ground Water Quality Standards Class IIA (N.J.A.C. 7:9C), January 2018. (http://www.nj.gov/dep/wms/bears/Appendix_Table_1.htm#/; downloaded 1/23/18)
(a-4) New Jersey Ground Water Quality Standard (N.J.A.C 7:9C), January 2018. (Interim Generic standard as listed in http://www.nj.gov/dep/standards/ground%20water.pdf; downloaded 1/25/18)
Synthetic organic chemicals lacking specific or interim specific criteria were assigned an interim generic standard value based on N.J.A.C. 7:9C: Appendix Table II.
(b) EPA Human health-based screening – RSL Tapwater (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected.
(http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
2. Surface Water criteria were selected from the lowest of:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Surface Water Quality Standards: Ecological Screening Criteria (Chronic), March 10, 2009
Accessed December 2017 (http://www.nj.gov/dep/srp/guidance/ecoscreening/, http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(a-2) EPA Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks, July 2006
https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf
(a-3) EPA National Recommended Aquatic Life Criteria table based on Freshwater CCC (chronic) values,
Accessed May 2017 (http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm)
(b) Human health screening criteria which were selected from the lowest of the following:
(b-1) NJDEP Surface Water Quality Standards: Human Health Criteria, October 2016
(http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(b-2) EPA National Recommended Water Quality Criteria, Human Health for the consumption of water and organism
Accessed May 2017 (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)
3. EPA Region 4 2018 Ecological Risk Assessment Supplemental Guidance (https://rais.ornl.gov/documents/era_regional_supplemental_guidance_report-march-2018_update.pdf) lists a freshwater surface water screening criteria for 1,4-dioxine = 22,000 ug/L.

CCC - criterion continuous concentration
µg/L - microgram per liter
NJDEP - New Jersey Department of Environmental Protection
NJ GWQC - New Jersey Groundwater Quality Criteria

NL - not listed
N/A - not applicable
RSL - regional screening level
SVOC - semi-volatile organics

Table 4-1c
Groundwater and Surface Water Screening Criteria - Metals
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	National Recommended Water Quality Criteria (Chronic)	EPA Region 3 (EPA3ECO)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
Aluminum	7429-90-5	200	NL	200	NL	20,000	200	NL	87	87	87	NL	NL	NL	87
Antimony	7440-36-0	6	6	6	NL	7.8	6	80	NL	30	80	5.6	5.6	5.6	5.6
Arsenic	7440-38-2	5	10	3	NL	0.052	3	150	150	5	150	0.017	0.018	0.017	0.017
Barium	7440-39-3	2,000	2,000	6,000	NL	3,800	2,000	220	NL	4	220	2,000	1,000	1,000	220
Beryllium	7440-41-7	4	4	1	NL	25	1	3.6	NL	0.66	3.6	6	NL	6	3.6
Cadmium**	7440-43-9	5	5	4	NL	NL	4	0.213	0.870	0.294	0.213	3.4	NL	3.4	0.2
Calcium	7440-70-2	NL	NL	NL	NL	NL	NL	NL	NL	116,000	116,000	NL	NL	NL	116,000
Chromium (hexavalent)*	18540-29-9	100	100	70	NL	0.035	70	10	11	11	10	NL	NL	NL	10
Cobalt	7440-48-4	NL	NL	100	NL	6	100	24	NL	23	24	NL	NL	NL	24
Copper**	7440-50-8	1,300	1,300	1,300	NL	800	1,300	10.5	NA	11.1	10.5	1,300	1,300	1,300	11
Iron	7439-89-6	300	NL	300	NL	14,000	300	NL	1,000	300	1,000	NL	NL	NL	1,000
Lead**	7439-92-1	15	15	5	NL	15	5	5.4	3.32	3.32	5.4	5	NL	5	5
Magnesium	7439-95-4	NL	NL	NL	NL	NL	NL	NL	NL	82,000	82,000	NL	NL	NL	82,000
Manganese	7439-96-5	50	NL	50	NL	NL	50	NL	NL	120	120	NL	50	50	50
Mercury	7439-97-6	2	0.002	2	NL	0.63	0.002	0.77	0.77	0.026	0.77	0.05	NL	0.05	0.05
Nickel**	7440-02-0	NL	NL	100	NL	390	100	54.7	64.5	64.5	54.7	500	610	500	54.74
Potassium	7440-09-7	NL	NL	NL	NL	NL	NL	NL	NL	53,000	53,000	NL	NL	NL	53,000
Selenium	7782-49-2	50	50	40	NL	100	40	5	5	1	5	170	170	170	5
Silver**	7440-22-4	100	NL	40	NL	94	40	4.98	3.2	4.98	4.98	170	NL	170	4.98
Sodium	7440-23-5	50,000	NL	50,000	NL	NL	50,000	NL	NL	680,000	680,000	NL	NL	NL	680,000
Thallium	7440-28-0	2	2	2	NL	0.2	2	10	NL	0.8	10	0.24	0.24	0.24	0.24
Vanadium	7440-62-2	NL	NL	NL	NL	86	86	12	NL	20	12	NL	NL	NL	12
Zinc**	7440-66-6	5,000	NL	2,000	NL	6,000	2,000	141	147	147	141	7,400	7,400	7,400	141

Notes:
1. Groundwater criteria were selected in a hierarchical fashion as follows:
(a) Lowest of the following:
(a-1) New Jersey Drinking Water Standards, February 10, 2009 (http://www.nj.gov/dep/standards/drinking%20water.pdf), downloaded May 13, 2017.
(a-2) EPA National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009. (https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf)
(a-3) New Jersey Ground Water Quality Standards Class IIA (N.J.A.C. 7:9C), January 2018. (http://www.nj.gov/dep/wms/bears/Appendix_Table_1.htm#/; downloaded 1/23/18)
(a-4) New Jersey Ground Water Quality Standard (N.J.A.C 7:9C), January 2018. (Interim Generic standard as listed in http://www.nj.gov/dep/standards/ground%20water.pdf; downloaded 1/25/18)
(b) EPA Human health-based screening – RSL Tapwater (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected.
(http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
2. Surface Water criteria were selected from the lowest of:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Surface Water Quality Standards: Ecological Screening Criteria (Chronic), March 10, 2009
Accessed December 2017 (http://www.nj.gov/dep/srp/guidance/ecoscreening/, http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(a-2) EPA Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks, July 2006
https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf
(a-3) EPA National Recommended Aquatic Life Criteria table based on Freshwater CCC (chronic) values, except for silver which is based on Freshwater CMC (acute) value.
Accessed May 2017 (http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm)
(b) Human health screening criteria which were selected from the lowest of the following:
(b-1) NJDEP Surface Water Quality Standards: Human Health Criteria, October 2016
(http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(b-2) EPA National Recommended Water Quality Criteria, Human Health for the consumption of water and organism
Accessed May 2017 (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)

* Chromium (total) NJ GWQS value was used for Chromium (hexavalent).
** Ecological screening criteria for these metals are a function of water hardness, with the exception of the NJDEP Ecological Screening Criteria for lead and the NRWQC for silver. A site-specific average surface water hardness of 129 mg/L was used.

CCC - criterion continuous concentration
CMC - criterion maximum concentration
µg/L - microgram per liter
NJDEP - New Jersey Department of Environmental Protection
NJ GWQC - New Jersey Groundwater Quality Criteria
NL - not listed
N/A - not applicable
RSL - regional screening level

CDM Smith

Table 4-1d
Groundwater and Surface Water Screening Criteria - Hardness-Dependent Criteria
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Surface Water			
		Ecological Screening Criteria			
		NJDEP Ecological Screening Criteria (Chronic)[1]	National Recommended Water Quality Criteria (Chronic)[2]	EPA Region 3 (EPA3ECO)[3]	Hardness-Dependent Ecological Screening Criteria for Surface Water
Cadmium	7440-43-9	0.21	0.87	0.29	0.21
Chromium (trivalent)	16065-83-1	29.41	91.30	91.30	29.41
Copper	7440-50-8	11	NA	11.13	10.53
Lead	7439-92-1	NA	3.32	3.32	3.32
Nickel	7440-02-0	54.74	64.51	64.51	54.74
Silver	7440-22-4	4.98	NA	4.98	4.98
Zinc	7440-66-6	141.24	146.59	146.59	141.24

Site-specific hardness (mg/L): 129

Notes:
µg/L - microgram per liter
NJDEP - New Jersey Department of Environmental Protection
NL - not listed
N/A - not applicable

[1] NJDEP freshwater aquatic chronic criteria for cadmium, chromium III, copper, nickel, and zinc are expressed as a function of water hardness. Criteria can be calculated at any hardness using these equations as listed below.

Cadmium:	Chronic dissolved criterion	$[e^{(0.7409 (\ln [hardness])-4.719)}]\ 0.651$
Chromium III:	Chronic dissolved criterion	$[e^{(0.819 (\ln [hardness])+0.6848)}]\ 0.277$
Copper:	Chronic dissolved criterion	$[e^{(0.8545 (\ln [hardness])-1.702)}]\ 0.908$
Nickel:	Chronic dissolved criterion	$[e^{(0.846 (\ln [hardness])+0.0584)}]\ 0.846$
Zinc:	Chronic dissolved criterion	$[e^{(0.8473 (\ln [hardness])+0.884)}]\ 0.950$

[2] National Recommended Water Quality Criteria for cadmium, chromium III, lead, nickel, and zinc are expressed as a function of water hardness and calculated with the equations listed below.

Cadmium:	Criterion continuous concentration	$[e^{(0.7977 (\ln [hardness])-3.909)}]*[1.101672-(\ln [hardness]*0.041838)]$
Chromium III:	Criterion continuous concentration	$[e^{(0.819 (\ln [hardness])+0.6848)}]*0.86$
Lead:	Criterion continuous concentration	$[e^{(1.273 (\ln [hardness])-4.705)}]*[1.46203-(\ln [hardness]*0.145712)]$
Nickel:	Criterion continuous concentration	$[e^{(0.846 (\ln [hardness])+0.0584)}]\ 0.997$
Zinc:	Criterion continuous concentration	$[e^{(0.8473 (\ln [hardness])+0.884)}]\ 0.986$

3 EPA Region 3 freshwater screening benchmarks for cadmium, chromium III, copper, lead, nickel, silver, and zinc are expressed as a function of water hardness and calculated with the equations listed below.

Cadmium:	Criterion continuous concentration	$[e^{(0.7409 (\ln [hardness])-4.719)}]*[1.101672-(\ln [hardness]*0.041838)]$
Chromium III:	Criterion continuous concentration	$[e^{(0.819 (\ln [hardness])+0.6848)}]*0.86$
Copper:	Criterion continuous concentration	$[e^{(0.8545 (\ln [hardness])-1.702)}]\ 0.96$
Lead:	Criterion continuous concentration	$[e^{(1.273 (\ln [hardness])-4.705)}]*[1.46203-(\ln [hardness]*0.145712)]$
Nickel:	Criterion continuous concentration	$[e^{(0.846 (\ln [hardness])+0.0584)}]\ 0.997$
Silver:	Criterion maximum concentration	$[e^{(1.72 (\ln [hardness])-6.59)}]\ 0.85$
Zinc:	Criterion continuous concentration	$[e^{(0.8473 (\ln [hardness])+0.884)}]\ 0.986$

Table 4-1e
Groundwater and Surface Water Screening Criteria - PCBs and Pesticides
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
Pesticides															
4,4'-DDD	72-54-8	NL	NL	0.1	NL	0.032	0.1	NL	0.011	0.001	0.011	0.00031	0.00031	0.00031	0.00031
4,4'-DDE	72-55-9	NL	NL	0.1	NL	0.046	0.1	0.0000000045	NL	0.001	0.0000000045	0.00022	0.00022	0.00022	0.0000000045
4,4'-DDT	50-29-3	NL	NL	0.1	NL	0.23	0.1	0.001	0.0005	0.001	0.001	0.00022	0.00022	0.00022	0.00022
Aldrin	309-00-2	NL	NL	0.04	NL	0.00092	0.04	0.017	3	3	0.017	0.000049	0.000049	0.000049	0.000049
alpa-BHC	319-84-6	NL	NL	0.02	NL	0.0072	0.02	12.4	NL	NL	12.4	0.0026	0.0026	0.0026	0.0026
beta-BHC	319-85-7	NL	NL	0.04	NL	0.025	0.04	0.495	NL	NL	0.495	0.0091	0.0091	0.0091	0.0091
cis-Chlordane (alpha)*	5103-71-9	0.5	2	0.5	NL	NL	0.5	0.0043	0.0022	0.0043	0.0043	0.0001	0.0008	0.0001	0.0001
delta-BHC	319-86-8	NL	NL	NL	5	NL	5	NL	141	NL	141	NL	NL	NL	141
Dieldrin	60-57-1	NL	NL	0.03	NL	0.0018	0.03	0.056	0.056	0.056	0.056	0.000052	0.000052	0.000052	0.000052
Endosulfan I	959-98-8	NL	NL	40	NL	NL	40	0.056	0.051	0.056	0.056	62	62	62	0.056
Endosulfan II	33213-65-9	NL	NL	40	NL	NL	40	0.056	0.051	0.056	0.056	62	62	62	0.056
Endosulfan sulfate	1031-07-8	NL	NL	40	NL	NL	40	2.22	NL	NL	2.22	62	62	62	2.22
Endrin	72-20-8	2	2	2	NL	2.3	2	0.036	0.036	0.036	0.036	0.059	0.059	0.059	0.036
Endrin aldehyde	7421-93-4	NL	NL	NL	100	NL	100	0.15	NL	NL	0.15	0.0590	0.2900	0.059	0.059
Endrin ketone	53494-7-5	NL	NL	NL	100	NL	100	NL	NL	NL	NL	NL	NL	NL	NL
gamma-BHC (Lindane)	58-89-9	0.2	0.2	0.03	NL	0.042	0.03	0.026	0.010	0.950	0.026	1	1	0.98	0.026
Heptachlor	76-44-8	0.4	0.4	0.05	NL	0.0014	0.05	0.0038	0.002	0.004	0.0038	0.000079	0.000079	0.000079	0.000079
Heptachlor epoxide	1024-57-3	0.2	0.2	0.2	NL	0.0014	0.2	0.0038	0.002	0.0038	0.0038	0.000039	0.000039	0.000039	0.000039
Methoxychlor	72-43-5	40	40	40	NL	37	40	0.03	0.019	0.03	0.03	40	100	40	0.03
Toxaphene	8001-35-2	3	3	2	NL	0.071	2	0.0002	0.0002	0.0002	0.0002	0.00028	0.00028	0.00028	0.0002
trans-Chlordane (gamma)*	5103-74-2	0.5	2	0.5	NL	NL	0.5	0.0043	0.0022	0.0043	0.0043	NL	0.0008	0.0008	0.0008

Table 4-1e
Groundwater and Surface Water Screening Criteria - PCBs and Pesticides
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/L)	CAS Number	Sample Matrix: Groundwater						Sample Matrix: Surface Water							
								Ecological Screening Criteria				Human Health Screening Criteria			
		New Jersey Drinking Water Standards (NJMCL)	EPA National Primary Drinking Water Standards	NJDEP Ground Water Quality Standards	NJDEP Interim Ground Water Quality Standards	EPA RSL for Tapwater	Groundwater Criteria[1]	NJDEP Ecological Screening Criteria (Chronic)	EPA Region 3 (EPA3ECO)	National Recommended Water Quality Criteria (Chronic)	Ecological Screening Criteria for Surface Water	NJDEP Surface Water Quality Criteria for Fresh Water	National Recommended Water Quality Criteria	Human Health Screening Criteria for Surface Water	Surface Water Criteria[2]
Polychlorinated Biphenyls															
Aroclor-1016**	12674-11-2	0.5	0.5	0.5	NL	0.22	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1221**	11104-28-2	0.5	0.5	0.5	NL	0.0047	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1232**	11141-16-5	0.5	0.5	0.5	NL	0.0047	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1242**	53469-21-9	0.5	0.5	0.5	NL	0.0078	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1248**	12672-29-6	0.5	0.5	0.5	NL	0.0078	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1254**	11097-69-1	0.5	0.5	0.5	NL	0.0078	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1260**	11096-82-5	0.5	0.5	0.5	NL	0.0078	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1262**	37324-23-5	0.5	0.5	0.5	NL	NL	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064
Aroclor-1268**	11100-14-4	0.5	0.5	0.5	NL	NL	0.5	0.014	0.00007	0.014	0.014	0.000064	0.000064	0.000064	0.000064

Notes:
1. Groundwater criteria were selected in a hierarchical fashion as follows:
(a) Lowest of the following:
(a-1) New Jersey Drinking Water Standards, February 10, 2009 (http://www.nj.gov/dep/standards/drinking%20water.pdf), downloaded May 13, 2017.
(a-2) EPA National Primary Drinking Water Standards, EPA 816-F-09-0004, May 2009. (https://www.epa.gov/sites/production/files/2016-06/documents/npwdr_complete_table.pdf)
(a-3) New Jersey Ground Water Quality Standards Class IIA (N.J.A.C. 7:9C), January 2018. (http://www.nj.gov/dep/wms/bears/Appendix_Table_1.htm#/; downloaded 1/23/18)
(a-4) New Jersey Ground Water Quality Standard (N.J.A.C 7:9C), January 2018. (Interim Generic standard as listed in http://www.nj.gov/dep/standards/ground%20water.pdf; downloaded 1/25/18)
Synthetic organic chemicals lacking specific or interim specific criteria were assigned an interim generic standard value based on N.J.A.C. 7:9C: Appendix Table II.
(b) EPA Human health-based screening – RSL Tapwater (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected.
(http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
2. Surface Water criteria were selected from the lowest of:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Surface Water Quality Standards: Ecological Screening Criteria (Chronic), March 10, 2009
Accessed December 2017 (http://www.nj.gov/dep/srp/guidance/ecoscreening/, http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(a-2) EPA Region 3 Biological Technical Assistance Group Freshwater Screening Benchmarks, July 2006
https://www.epa.gov/sites/production/files/2015-09/documents/r3_btag_fw_benchmarks_07-06.pdf
(a-3) EPA National Recommended Aquatic Life Criteria table based on Freshwater CCC (chronic) values,
Accessed May 2017 (http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm)
(b) Human health screening criteria which were selected from the lowest of the following:
(b-1) NJDEP Surface Water Quality Standards: Human Health Criteria, October 2016
(http://www.nj.gov/dep/rules/rules/njac7_9b.pdf)
(b-2) EPA National Recommended Water Quality Criteria, Human Health for the consumption of water and organism
Accessed May 2017 (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table)
*Chlordane GWQC and SWQC was used for alpha-chlordane and gamma-chlordane.
** Total PCBs (Polychlorinated biphenyls) GWQC and SWQC were used for all Aroclors. Aroclor data within each sample will be summed for comparison to the total PCB screening criteria.

CCC - criterion continuous concentration
µg/L - microgram per liter
NL - not listed
N/A - not applicable
NJDEP - New Jersey Department of Environmental Protection
NJ GWQC - New Jersey Groundwater Quality Criteria
RSL - regional screening level
PCB - polychlorinated biphenyl

Table 4-2a
Soil and Sediment Screening Criteria - VOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
1,1,1-Trichloroethane	71-55-6	160,000,000	8,100,000	160,000,000	29,800	NL	NL	29,800	29,800	160,000,000	213	30.2	213	8,100,000	213
1,1,2,2-Tetrachloroethane	79-34-5	1,000	600	1,000	127	NL	NL	127	127	1,000	850	1360	850	600	850
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	NL	6,700,000	6,700,000	NL	NL	NL	NL	NL	6,700,000	NL	NL	NL	6,700,000	6,700,000
1,1,2-Trichloroethane	79-00-5	2,000	1,100	2,000	28,600	NL	NL	28,600	28,600	2,000	518	1240	518	1,100	518
1,1-Dichloroethane	75-34-3	8,000	3,600	8,000	NL	NL	NL	20,100	20,100	8,000	NL	NL	NL	3,600	3,600
1,1-Dichloroethene	75-35-4	11,000	230,000	11,000	8,280	NL	NL	8,280	8,280	11,000	19.4	31	19.4	230,000	19
1,2,3-Trichlorobenzene	87-61-6	NL	63,000	63,000	20,000	NL	20,000	NL	20,000	63,000	NL	858	858	63,000	858
1,2,4-Trichlorobenzene	120-82-1	73,000	24,000	73,000	20,000	NL	20,000	11,100	20,000	73,000	5,062	2,100	5,062	24,000	5,062
1,2-Dibromo-3-chloropropane	96-12-8	80	5	80	NL	NL	NL	35.2	35.2	80	NL	NL	NL	5	5
1,2-Dibromoethane	106-93-4	8	36	8	NL	NL	NL	1,230	1,230	8	NL	NL	NL	36	36
1,2-Dichlorobenzene	95-50-1	5,300,000	1,800,000	5,300,000	2,960	NL	NL	2,960	2,960	5,300,000	294	16.5	294	1,800,000	294
1,2-Dichloroethane	107-06-2	900	460	900	21,200	NL	NL	21,200	21,200	900	260	NL	260	460	260
1,2-Dichloropropane	78-87-5	2,000	2,500	2,000	32,700	NL	NL	32,700	32,700	2,000	333	NL	333	2,500	333
1,3-Dichlorobenzene	541-73-1	5,300,000	NL	5,300,000	37,700	NL	NL	37,700	37,700	5,300,000	1,315	4,430	1315	NL	1,315
1,4-Dichlorobenzene	106-46-7	5,000	2,600	5,000	546	NL	20,000	546	546	5,000	318	599	318	2,600	318
2-Butanone	78-93-3	3,100,000	27,000,000	3,100,000	NL	NL	NL	89,600	89,600	3,100,000	NL	NL	NL	27,000,000	27,000,000
2-Hexanone	591-78-6	NL	200,000	200,000	NL	NL	NL	12,600	12,600	200,000	NL	NL	NL	200,000	200,000
4-Methyl-2-pentanone	108-10-1	NL	33,000,000	33,000,000	NL	NL	NL	443,000	443,000	33,000,000	NL	NL	NL	33,000,000	33,000,000
Acetone	67-64-1	70,000,000	61,000,000	70,000,000	NL	NL	NL	2,500	2,500	70,000,000	NL	NL	NL	61,000,000	61,000,000
Benzene	71-43-2	2,000	1,200	2,000	255	NL	NL	255	255	2,000	142	NL	142	1,200	142
Bromochloromethane	74-97-5	NL	150,000	150,000	NL	NL	NL	NL	NL	150,000	NL	NL	NL	150,000	150,000
Bromodichloromethane	75-27-4	1,000	290	1,000	540	NL	NL	540	540	1,000	NL	NL	NL	290	290
Bromoform	75-25-2	81,000	19,000	81,000	15,900	NL	NL	15,900	15,900	81,000	492	654	492	19,000	492
Bromomethane	74-83-9	25,000	6,800	25,000	235	NL	NL	235	235	25,000	1.37	NL	1.37	6,800	1.37
Carbon Disulfide	75-15-0	7,800,000	770,000	7,800,000	NL	NL	NL	94.1	94	7,800,000	NL	0.851	0.851	770,000	1
Carbon Tetrachloride	56-23-5	2,000	650	2,000	2,980	NL	NL	2,980	2,980	2,000	1,450	64.2	1,450	650	1,450
Chlorobenzene	108-90-7	510,000	280,000	510,000	13,100	NL	40,000	13,100	13,100	510,000	291	8.42	291	280,000	291
Chloroethane	75-00-3	220,000	14,000,000	220,000	NL	NL	NL	NL	NL	220,000	NL	NL	NL	14,000,000	14,000,000
Chloroform	67-66-3	600	320	600	1,190	NL	NL	1,190	1,190	600	121	NL	121	320	121
Chloromethane	74-87-3	4,000	110,000	4,000	NL	NL	NL	10,400	10,400	4,000	NL	NL	NL	110,000	110,000
cis-1,2-Dichloroethene	156-59-2	230,000	160,000	230,000	NL	NL	NL	NL	NL	230,000	NL	NL	NL	160,000	160,000
cis-1,3-Dichloropropene	542-75-6	2,000	1,800	2,000	NL	NL	NL	398	398	2,000	NL	NL	NL	1,800	1,800
Cyclohexane	110-82-7	NL	6,500,000	6,500,000	NL	NL	NL	NL	NL	6,500,000	NL	NL	NL	6,500,000	6,500,000
Dibromochloromethane	124-48-1	3,000	8,300	3,000	2,050	NL	NL	2,050	2,050	3,000	NL	NL	NL	8,300	8,300
Dichlorodifluoromethane	75-71-8	490,000	87,000	490,000	NL	NL	NL	39,500	39,500	490,000	NL	NL	NL	87,000	87,000
Ethylbenzene	100-41-4	7,800,000	5,800	7,800,000	5,160	NL	NL	5,160	5,160	7,800,000	175	1,100	175	5,800	175
Isopropylbenzene	98-82-8	NL	1,900,000	1,900,000	NL	NL	NL	NL	NL	1,900,000	NL	86	86	1,900,000	86
m,p-Xylene*	108-38-3	12,000,000	550,000	12,000,000	NL	NL	NL	10000	10,000	12,000,000	433	NL	433	550,000	433
Methyl Acetate	79-20-9	78,000,000	78,000,000	78,000,000	NL	NL	NL	NL	NL	78,000,000	NL	NL	NL	78,000,000	78,000,000
Methyl tert-Butyl Ether	1634-04-4	110,000	47,000	110,000	NL	NL	NL	NL	NL	110,000	NL	NL	NL	47,000	47,000
Methylcyclohexane	108-87-2	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Methylene Chloride	75-09-2	46,000	57,000	46,000	4,050	NL	NL	4,050	4,050	46,000	159	NL	159	57,000	159
o-Xylene*	95-47-6	12,000,000	650,000	12,000,000	NL	NL	NL	10,000	10,000	12,000,000	433	NL	433	650,000	433
Styrene	100-42-5	90,000	6,000,000	90,000	4,690	NL	300,000	4,690	4,690	90,000	254	559	254	6,000,000	254
Tetrachloroethene	127-18-4	43,000	24,000	43,000	9,920	NL	NL	9,920	9,920	43,000	450	468	450	24,000	450

Table 4-2a
Soil and Sediment Screening Criteria - VOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
Toluene	108-88-3	6,300,000	4,900,000	6,300,000	200,000	NL	200,000	5,450	200,000	6,300,000	1,220	NL	1,220	4,900,000	1,220
trans-1,2-Dichloroethene	156-60-5	300,000	1,600,000	300,000	784	NL	NL	784	784	300,000	654	1,050	654	1,600,000	654
trans-1,3-Dichloropropene	542-75-6	2,000	1,800	2,000	NL	NL	NL	398	398	2,000	NL	NL	NL	1,800	1,800
Trichloroethene	79-01-6	3,000	940	3,000	12,400	NL	NL	12,400	12,400	3,000	112	96.9	112	940	112
Trichlorofluoromethane	75-69-4	23,000,000	23,000,000	23,000,000	NL	NL	NL	16,400	16,400	23,000,000	NL	NL	NL	23,000,000	23,000,000
Vinyl Chloride	75-01-4	700	59	700	646	NL	NL	646	646	700	202	NL	202	59	202
Xylenes (Total)	1330-20-7	12,000,000	580,000	12,000,000	10,000	NL	NL	10,000	10,000	12,000,000	433	NL	433	580,000	433

Notes:
1. Soil criteria were selected in a hierarchical manner arranged as follows:
(a) NJDEP Risk-based and remediation standard criteria for Residential Direct Contact Soil Remediation Standard, Last Amended September 2017 (http://www.nj.gov/dep/srp/regs/rs/)
(b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
(c) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(c-1) NJDEP Ecological Screening Criteria for soil, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
NJDEP presents six types of ecological screening criteria for soil; the lowest value among the six was used.
(c-2) EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
(c-3) Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
(c-4) EPA 2003. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels.
2. Sediment criteria were selected in a hierarchical manner arranged as follows:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Ecological Screening Criteria for the lowest effects level for fresh water criteria, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
(a-2) EPA Region 3 Freshwater Sediment Screening Benchmarks, August 2006 (https://www.epa.gov/risk/freshwater-sediment-screening-benchmarks)
(b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)

*Xylene (total) was used for m,p-xylene and o-xylene criteria.

CLP - contract laboratory program
CRQL - contract required quantitation limit
MDL - method detection limit
µg/kg - microgram per kilogram
N/A - not applicable
NJDEP - New Jersey Department of Environmental Protection
NL - not listed
PAL - project action limit
PQLG - project quantitation limit goal
RSL - regional screening level
VOC - volatile organic compound

Table 4-2b
Soil and Sediment Screening Criteria - SVOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil – Human Health Screening Criteria: NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	Sample Matrix: Soil – NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	Sample Matrix: Sediment – Ecological Screening Criteria: NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
1,1'-Biphenyl	92-52-4	61,000	47,000	61,000	60,000	NL	60,000	NL	60,000	61,000	NL	1,220	1,220	47,000	1,220
1,4-Dioxane	123-91-1	NL	5,300	5,300	NL	NL	NL	2,050	2,050	5,300	NL	NL	NL	5,300	5,300
1,2,4,5-Tetrachlorobenzene	95-94-3	NL	23,000	23,000	2,020	NL	NL	2,020	2,020	23,000	1,252	1,090	1,252	23,000	1,252
2,2'-oxybis(1-Chloropropane)	108-60-1	23,000	3,100,000	23,000	19,900	NL	NL	19,900	19,900	23,000	NL	NL	NL	3,100,000	3,100,000
2,3,4,6-Tetrachlorophenol	58-90-2	NL	1,900,000	1,900,000	NL	NL	NL	199	199	1,900,000	NL	284	284	1,900,000	284
2,4,5-Trichlorophenol	95-95-4	6,100,000	6,300,000	6,100,000	4,000	NL	9,000	14,100	4,000	6,100,000	NL	NL	NL	6,300,000	6,300,000
2,4,6-Trichlorophenol	88-06-2	19,000	49,000	19,000	4,000	NL	4,000	9,940	4,000	19,000	208	213	208	49,000	208
2,4-Dichlorophenol	120-83-2	180,000	190,000	180,000	87,500	NL	NL	87,500	87,500	180,000	81.7	117	81.7	190,000	82
2,4-Dimethylphenol	105-67-9	1,200,000	1,300,000	1,200,000	10	NL	NL	10	10	1,200,000	304	29	304	1,300,000	304
2,4-Dinitrophenol	51-28-5	120,000	130,000	120,000	60.9	NL	20,000	60.9	60.9	120,000	6.21	NL	6.21	130,000	6
2,4-Dinitrotoluene	121-14-2	700	1,700	700	1,280	NL	NL	1,280	1,280	700	14.4	41.6	14.4	1,700	14
2,6-Dinitrotoluene	606-20-2	700	360	700	NL	NL	NL	32.8	32.8	700	NL	NL	NL	360	360
2-Chloronaphthalene	91-58-7	NL	4,800,000	4,800,000	12.2	NL	NL	12.2	12.2	4,800,000	417	NL	417	4,800,000	417
2-Chlorophenol	95-57-8	310,000	390,000	310,000	243	NL	NL	243	243	310,000	31.9	31.2	31.9	390,000	32
2-Methylnaphthalene	91-57-6	230,000	240,000	230,000	3,240	NL	NL	3,240	3,240	230,000	20.2	20.2	20	240,000	20
2-Methylphenol	95-48-7	310,000	3,200,000	310,000	NL	NL	NL	40,400	40,400	310,000	NL	NL	NL	3,200,000	3,200,000
2-Nitroaniline	88-74-4	39,000	630,000	39,000	NL	NL	NL	74,100	74,100	39,000	NL	NL	NL	630,000	630,000
2-Nitrophenol	88-75-5	NL	NL	NL	NL	NL	NL	1,600	1,600	1,600	NL	NL	NL	NL	NL
3,3'-Dichlorobenzidine	91-94-1	1,000	1,200	1,000	646	NL	NL	646	646	1,000	127	127	127	1,200	127
3-Methylphenol	108-39-4	NL	3,200,000	3,200,000	NL	NL	NL	NL	NL	3,200,000	NL	NL	NL	3,200,000	3,200,000
3-Nitroaniline	99-09-2	NL	NL	NL	NL	NL	NL	3,160	3,160	3,160	NL	NL	NL	NL	NL
4,6-Dinitro-2-methylphenol	534-52-1	6,000	5,100	6,000	NL	NL	NL	144	144	6,000	NL	NL	NL	5,100	5,100
4-Bromophenyl-phenylether	101-55-3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	1,230	1,230	NL	1,230
4-Chloro-3-methylphenol	59-50-7	NL	6,300,000	6,300,000	NL	NL	NL	7,950	7,950	6,300,000	NL	NL	NL	6,300,000	6,300,000
4-Chloroaniline	106-47-8	NL	2,700	2,700	NL	NL	NL	1,100	1,100	2,700	NL	NL	NL	2,700	2,700
4-Chlorophenyl-phenyl ether	7005-72-3	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
4-Methylphenol	106-44-5	31,000	6,300,000	31,000	NL	NL	NL	163,000	163,000	31,000	NL	670	670	6,300,000	670
4-Nitroaniline	100-01-6	NL	27,000	27,000	NL	NL	NL	21,900	21,900	27,000	NL	NL	NL	27,000	27,000
4-Nitrophenol	100-02-7	NL	NL	NL	5,120	NL	7,000	5,120	5,120	5,120	13.3	NL	13.3	NL	13
Acenaphthene	83-32-9	3,400,000	3,600,000	3,400,000	20,000	29,000	20,000	682,000	20,000	3,400,000	6.71	6.7	6.71	3,600,000	6.71
Acenaphthylene	208-96-8	NL	NL	NL	682,000	29,000	NL	682,000	682,000	682,000	5.87	5.9	6	NL	5.87
Acetophenone	98-86-2	2,000	7,800,000	2,000	NL	NL	NL	300,000	300,000	2,000	NL	NL	NL	7,800,000	7,800,000
Anthracene	120-12-7	17,000,000	18,000,000	17,000,000	1,480,000	29,000	NL	1,480,000	1,480,000	17,000,000	57.2	57.2	57.2	18,000,000	57.2
Atrazine	1912-24-9	210,000	2,400	210,000	NL	NL	NL	NL	NL	210,000	NL	6.62	6.62	2,400	6.62
Benzaldehyde	100-52-7	6,100,000	170,000	6,100,000	NL	NL	NL	NL	NL	6,100,000	NL	NL	NL	170,000	170,000
Benzo(a)anthracene	56-55-3	5,000	1,100	5,000	5,210	1,100	NL	5,210	5,210	5,000	108	108	108	1,100	108
Benzo(a)pyrene	50-32-8	500	110	500	1,520	1,100	NL	1,520	1,520	500	150	150	150	110	150
Benzo(b)fluoranthene	205-99-2	5,000	1,100	5,000	59,800	1,100	NL	59,800	59,800	5,000	10,400	NL	10,400	1,100	10,400
Benzo(g,h,i)perylene	191-24-2	380,000,000	NL	380,000,000	119,000	1,100	NL	119,000	119,000	380,000,000	170	170	170	NL	170
Benzo(k)fluoranthene	207-08-9	45,000	11,000	45,000	148,000	1,100	NL	148,000	148,000	45,000	240	240	240	11,000	240
bis(2-Chloroethoxy) methane	111-91-1	NL	190,000	190,000	NL	NL	NL	302	302	190,000	NL	NL	NL	190,000	190,000
bis(2-Chloroethyl) ether	111-44-4	400	230	400	23,700	NL	NL	23,700	23,700	400	3,520	NL	3,520	230	3,520
bis-(2-Ethylhexyl)phthalate	117-81-7	35,000	39,000	35,000	925	NL	NL	925	925	35,000	182	180	182	39,000	182
Butylbenzylphthalate	85-68-7	1,200,000	290,000	1,200,000	239	NL	NL	239	239	1,200,000	1,970	10,900	1,970	290,000	1,970
Caprolactam	105-60-2	31,000,000	31,000,000	31,000,000	NL	NL	NL	NL	NL	31,000,000	NL	NL	NL	31,000,000	31,000,000
Carbazole	86-74-8	24,000	NL	24,000	NL	NL	NL	NL	NL	24,000	NL	NL	NL	NL	NL
Chrysene	218-01-9	450,000	110,000	450,000	4,730	1,100	NL	4,730	4,730	450,000	166	166	166	110,000	166
Dibenzo(a,h)anthracene	53-70-3	500	110	500	18,400	1,100	NL	18,400	18,400	500	33	33	33	110	33
Dibenzofuran	132-64-9	NL	73,000	73,000	NL	NL	NL	NL	NL	73,000	NL	415	415	73,000	415
Diethylphthalate	84-66-2	49,000,000	51,000,000	49,000,000	24,800	NL	100,000	24,800	24,800	49,000,000	295	603	295	51,000,000	295
Dimethylphthalate	131-11-3	NL	NL	NL	NL	NL	NL	734,000	734,000	734,000	NL	NL	NL	NL	NL
Di-n-butylphthalate	84-74-2	6,100,000	6,300,000	6,100,000	150	NL	200,000	150	150	6,100,000	1,114	6,470	1,114	6,300,000	1,114

CDM Smith

Table 4-2b
Soil and Sediment Screening Criteria - SVOCs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
Di-n-octylphthalate	117-84-0	2,400,000	630,000	2,400,000	NL	NL	NL	709,000	709,000	2,400,000	NL	NL	NL	630,000	630,000
Fluoranthene	206-44-0	2,300,000	2,400,000	2,300,000	122,000	1,100	NL	122,000	122,000	2,300,000	423	423	423	2,400,000	423
Fluorene	86-73-7	2,300,000	2,400,000	2,300,000	122,000	29,000	NL	122,000	122,000	2,300,000	77.4	77.4	77.4	2,400,000	77.4
Hexachlorobenzene	118-74-1	300	210	300	199	NL	NL	199	199	300	20	20	20	210	20
Hexachlorobutadiene	87-68-3	6,000	1,200	6,000	39.8	NL	NL	39.8	39.8	6,000	26.5	NL	27	1,200	27
Hexachlorocyclopentadiene	77-47-4	45,000	1,800	45,000	755	NL	10,000	755	755	45,000	901	NL	901	1,800	901
Hexachloroethane	67-72-1	12,000	1,800	12,000	596	NL	NL	596	596	12,000	584	1,027	584	1,800	584
Indeno(1,2,3-cd)pyrene	193-39-5	5,000	1,100	5,000	109,000	1,100	NL	109,000	109,000	5,000	200	17	200	1,100	200
Isophorone	78-59-1	510,000	570,000	510,000	139,000	NL	NL	139,000	139,000	510,000	432	NL	432	570,000	432
Naphthalene	91-20-3	6,000	3,800	6,000	99.4	29,000	NL	99.4	99.4	6,000	160	176	160	3,800	160
Nitrobenzene	98-95-3	5,000	5,100	5,000	1,310	NL	NL	1,310	1,310	5,000	145	NL	145	5,100	145
N-Nitroso-di-n-propylamine	86-30-6	99,000	110,000	99,000	545	NL	NL	544	545	99,000	NL	NL	NL	110,000	110,000
N-Nitrosodiphenylamine	621-64-7	200	78	200	NL	NL	NL	545	545	200	NL	2,680	2,680	78	2,680
Pentachlorophenol	87-86-5	900	1,000	900	119	2,100	3,000	119	119	900	23,000	504	23,000	1,000	23,000
Phenanthrene	85-01-8	NL	NL	NL	45,700	29,000	NL	45,700	45,700	45,700	204	204	204	NL	204
Phenol	108-95-2	18,000,000	19,000,000	18,000,000	30,000	NL	30,000	120,000	30,000	18,000,000	49.1	420	49.1	19,000,000	49
Pyrene	129-00-0	1,700,000	1,800,000	1,700,000	78,500	1,100	NL	78,500	78,500	1,700,000	195	195	195	1,800,000	195

Notes:

1. Soil criteria were selected in a hierarchical manner arranged as follows:
 (a) NJDEP Risk-based and remediation standard criteria for Residential Direct Contact Soil Remediation Standard, September 2017 (http://www.nj.gov/dep/srp/regs/rs/)
 (b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
 (c) Ecological screening criteria which were selected in a hierarchical fashion as follows:
  (c-1) NJDEP Ecological Screening Criteria for soil, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
   NJDEP presents six types of ecological screening criteria for soil; the lowest value among the six was used.
  (c-2) EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
   Values for some SVOCs are based on the low molecular weight or high molecular weight PAHs
  (c-3) Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
   Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
  (c-4) EPA 2003. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels.
2. Sediment criteria were selected in a hierarchical manner arranged as follows:
 (a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
  (a-1) NJDEP Ecological Screening Criteria for the lowest effects level for fresh water criteria, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
  (a-2) EPA Region 3 Freshwater Sediment Screening Benchmarks, August 2006 (https://www.epa.gov/risk/freshwater-sediment-screening-benchmarks)
 (b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)

*Xylene (total) was used for m,p-xylene and o-xylene PAL criteria. M-xylene and p-xylene are reported as one compound under S0M02.4.

CLP - contract laboratory program
CRQL - contract required quantitation limit
MDL - method detection limit
µg/kg - microgram per kilogram
N/A - not applicable
NJDEP - New Jersey Department of Environmental Protection

Table 4-2c
Soil and Sediment Screening Criteria - Metals
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: mg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
Aluminum	7429-90-5	78,000	77,000	78,000	50	NL	NL	NL	50	78,000	25,500	NL	25,500	77,000	25,500
Antimony	7440-36-0	31	31	31	0.27	0.27	5	0.142	0.27	31	3	2	3	31	3
Arsenic	7440-38-2	19	0.68	19	9.9	18	9.9	5.7	9.9	19	6	9.80	6	0.68	6
Barium*	7440-39-3	16,000	15,000	16,000	283	330	283	1.04	283	16,000	48	NL	48	15,000	48
Beryllium	7440-41-7	16	160	16	10	21	10	1.06	10	16	NL	NL	NL	160	160
Cadmium	7440-43-9	78	71	78	0.36	0.36	4	0.00222	0.36	78	0.6	0.99	0.6	71	0.6
Calcium	7440-70-2	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Chromium**	7440-47-3	NL	NL	NL	0.4	26	0.4	0.4	0.4	0.4	26	43.4	26	NL	26
Chromium (hexavalent)	18540-29-9	1	0.3	1	130	130	NL	NL	130	1	NL	NL	NL	0.3	0.3
Cobalt	7440-48-4	1,600	23	1,600	0.14	13	20	0.14	0.14	1,600	50	50	50	23	50
Copper	7440-50-8	3,100	3,100	3,100	5.4	28	60	5.4	5.4	3,100	16	31.6	16	3,100	16
Iron	7439-89-6	NL	55,000	55,000	NL	NL	NL	NL	NL	55,000	NL	20,000	20000	55,000	20,000
Lead	7439-92-1	400	400	400	0.0537	11	40.5	0.0537	0.0537	400	31	35.8	31	400	31
Magnesium	7439-95-4	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Manganese	7439-96-5	11,000	1,800	11,000	220	220	NL	NL	220	11,000	630	460	630	1800	630
Mercury	7439-97-6	23	11	23	0.00051	NL	0.00051	0.1	0.00051	23	0.174	0.18	0.174	11	0.174
Nickel	7440-02-0	1,600	1,500	1,600	13.6	38	30	13.6	13.6	1,600	16	22.7	16	1,500	16
Potassium	7440-09-7	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Selenium	7782-49-2	390	390	390	0.0276	0.52	0.21	0.0276	0.0276	390	NL	2	2	390	2
Silver	7440-22-4	390	390	390	2	4.2	2	4.04	2	390	0.5	1.0	0.5	390	0.5
Sodium	7440-23-5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
Thallium	7440-28-0	NL	1	1	1	NL	1	0.0569	1	1	NL	NL	NL	0.78	0.78
Vanadium	7440-62-2	78	390	78	2	7.8	2	1.59	2	78	NL	NL	NL	390	390
Zinc	7440-66-6	23,000	23,000	23,000	6.62	46	8.5	6.62	6.62	23,000	120	121	120	23,000	120

Notes:
1. Soil criteria were selected in a hierarchical manner arranged as follows:
(a) NJDEP Risk-based and remediation standard criteria for Residential Direct Contact Soil Remediation Standard, September 2017 (http://www.nj.gov/dep/srp/regs/rs/)
Value for hexavalent chromium - Derivation of an Ingestion-Based Soil Remediation Criterion for Cr+6 Based on the NTP Chronic Bioassay Data for Sodium Dichromate Dihydrate. http://www.state.nj.us/dep/dsr/chromium/ingestion-cr.pdf. June 2009
(b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
(c) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(c-1) NJDEP Ecological Screening Criteria for soil, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
NJDEP presents six types of ecological screening criteria for soil; the lowest value among the six was used.
(c-2) EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
(c-3) Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
(c-4) EPA 2003. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels.
2. Sediment criteria were selected in a hierarchical manner arranged as follows:
(a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
(a-1) NJDEP Ecological Screening Criteria for the lowest effects level for fresh water criteria, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
(a-2) EPA Region 3 Freshwater Sediment Screening Benchmarks, August 2006 (https://www.epa.gov/risk/freshwater-sediment-screening-benchmarks)
(b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected. (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)

CLP - contract laboratory program
CRQL - contract required quantitation limit
MCL - Maximum Contaminant Level
MDL - method detection limit
mg/kg - milligram per kilogram
N/A - Not Applicable
NJDEP - New Jersey Department of Environmental Protection

* Barium NJDEP sediment ecological screening criteria is based on a saline acute value in the absence of a freshwater value.
** Chromium EPA EcoSSL soil value is for Chromium (trivalent).

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Table 4-2d
Soil and Sediment Screening Criteria - Pesticides and PCBs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
Pesticides															
4,4'-DDD[+]	72-54-8	3,000	1,900	3,000	758	21	NL	758	758	3,000	4.88	4.88	4.88	1,900	4.88
4,4'-DDE[+]	72-55-9	2,000	2,000	2,000	596	21	NL	596	596	2,000	3.16	3.16	3.16	2,000	3.16
4,4'-DDT[+]	50-29-3	2,000	1,900	2,000	3.5	21	NL	3.5	3.5	2,000	4.16	4.16	4.16	1,900	4.16
Aldrin	309-00-2	40	39	40	3.32	NL	NL	3.32	3.32	40	2	2	2	39	2
alpa-BHC	319-84-6	100	86	100	99.4	NL	NL	99.4	99.4	100	6	6	6	86	6
beta-BHC	319-85-7	400	300	400	3.98	NL	NL	3.98	3.98	400	5	5	5	300	5
cis-Chlordane (alpha)*	5103-71-9	200	1,700	200	224	NL	NL	224	224	200	3.24	3.24	3.24	1,700	3.24
delta-BHC	319-86-8	NL	570	570	NL	NL	NL	9,940	9,940	570	NL	6,400	6,400	570	6,400
Dieldrin	60-57-1	40	34	40	2.38	4.9	NL	2.38	2.38	40	1.9	1.9	1.9	34	1.9
Endosulfan I	959-98-8	470,000	470,000	470,000	NL	NL	NL	119	119	470,000	NL	2.9	2.9	470,000	2.9
Endosulfan II	33213-65-9	470,000	470,000	470,000	NL	NL	NL	119	119	470,000	NL	14	14	470,000	14
Endosulfan sulfate	1031-07-8	470,000	470,000	470,000	35.8	NL	NL	35.8	36	470,000	34.6	5.4	34.6	470,000	34.6
Endrin	72-20-8	23,000	19,000	23,000	10.1	NL	NL	10.1	10.1	23,000	2.22	2.22	2.22	19,000	2.22
Endrin aldehyde	7421-93-4	NL	NL	NL	10.5	NL	NL	10.5	10.5	10.5	480	NL	480	NL	480
Endrin ketone	53494-7-5	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL	NL
gamma-BHC (Lindane)	58-89-9	400	570	400	5	NL	NL	5	5	400	3	2.37	3	570	3
Heptachlor	76-44-8	100	130	100	5.98	NL	NL	5.98	5.98	100	0.6	68	0.6	130	0.6
Heptachlor epoxide	1024-57-3	70	70	70	152	NL	NL	152	152	70	2.47	2.47	2.47	70	2.47
Methoxychlor	72-43-5	390,000	320,000	390,000	19.9	NL	NL	19.9	19.9	390,000	13.6	18.7	13.6	320,000	13.6
Toxaphene	8001-35-2	600	490	600	119	NL	NL	119	119	600	0.077	0.1	0.077	490	0.077
trans-Chlordane (gamma)*	5103-74-2	200	1,700	200	224	NL	NL	224	224	200	3.24	3.24	3.24	1,700	3.24

Table 4-2d
Soil and Sediment Screening Criteria - Pesticides and PCBs
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte (All Units: µg/kg)	CAS Number	Sample Matrix: Soil									Sample Matrix: Sediment				
		Human Health Screening Criteria									Ecological Screening Criteria				
		NJDEP Residential Direct Contact Remediation Standard	EPA RSL for Residential Soil	Human Health Screening Criteria for Soil	NJDEP Ecological Screening Criteria for Soil	EPA EcoSSLs	PRGs for Ecological Endpoints	EPA Region 5	Ecological Screening Criteria for Soil	Soil Criteria[1]	NJDEP Fresh Water Sediment	EPA Region 3 Freshwater	Ecological Screening Criteria for Sediment	EPA RSL for Residential Soil	Sediment Criteria[2]
Polychlorinated Biphenyls (PCBs)															
Aroclor-1016**	12674-11-2	200	4,100	200	0.332	NL	371	0.332	0.332	200	7	59.8	7	4,100	7
Aroclor-1221**	11104-28-2	200	200	200	0.332	NL	371	0.332	0.332	200	59.8	59.8	59.8	200	59.8
Aroclor-1232**	11141-16-5	200	170	200	0.332	NL	371	0.332	0.332	200	59.8	59.8	59.8	170	59.8
Aroclor-1242**	53469-21-9	200	230	200	0.332	NL	371	0.332	0.332	200	59.8	59.8	59.8	230	59.8
Aroclor-1248**	12672-29-6	200	230	200	0.332	NL	371	0.332	0.332	200	30	59.8	30	230	30
Aroclor-1254**	11097-69-1	200	240	200	0.332	NL	371	0.332	0.332	200	60	59.8	60	240	60
Aroclor-1260**	11096-82-5	200	240	200	0.332	NL	371	0.332	0.332	200	5	59.8	5	240	5
Aroclor-1262**	37324-23-5	200	NL	200	0.332	NL	371	0.332	0.332	200	59.8	59.8	59.8	NL	59.8
Aroclor-1268**	11100-14-4	200	NL	200	0.332	NL	371	0.332	0.332	200	59.8	59.8	59.8	NL	59.8

Notes:

1. Soil criteria were selected in a hierarchical manner arranged as follows:
   (a) NJDEP Risk-based and remediation standard criteria for Residential Direct Contact Soil Remediation Standard, September 2017 (http://www.nj.gov/dep/srp/regs/rs/)
   (b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected.
   (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)
   (c) Ecological screening criteria which were selected in a hierarchical fashion as follows:
   (c-1) NJDEP Ecological Screening Criteria for soil, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
   NJDEP presents six types of ecological screening criteria for soil; the lowest value among the six was used.
   (c-2) EPA Ecological Soil Screening Levels (EcoSSLs). http://www.epa.gov/ecotox/ecossl/
   (c-3) Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1997. Preliminary Remediation Goals (PRGs) for Ecological Endpoints.
   Prepared for the U.S. Department of Energy, Office of Environmental Management Contract No. DE-AC05-84OR21401.
   (c-4) EPA 2003. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Ecological Screening Levels.
2. Sediment criteria were selected in a hierarchical manner arranged as follows:
   (a) Ecological screening criteria which were selected in a hierarchical fashion as follows:
   (a-1) NJDEP Ecological Screening Criteria for the lowest effects level for fresh water criteria, March 2009 (http://www.nj.gov/dep/srp/guidance/ecoscreening/)
   (a-2) EPA Region 3 Freshwater Sediment Screening Benchmarks, August 2006 (https://www.epa.gov/risk/freshwater-sediment-screening-benchmarks)
   (b) EPA Human health-based screening – RSL residential soil values (Target Risk = 1E-06; Target Hazard Quotient = 1), November 2017. The lower value of the RSLSs derived from cancer versus noncancer endpoints was selected.
   (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm)

CLP - contract laboratory program
CRQL - contract required quantitation limit
MDL - method detection limit
µg/kg - microgram per kilogram
N/A - not applicable
NJDEP - New Jersey Department of Environmental Protection

*Chlordane NJDEP wildlife PRG was used for alpha-chlordane and gamma-chlordane.
** Total PCBs (Polychlorinated biphenyls) value was used for all Aroclors for NJDEP Ecological Screening Criteria for soil, and for the following Aroclors for NJDEP sediment criteria: Aroclors 1221, 1232, 1242, 1262, and 1268. Aroclor data within each sample will be summed for comparison to screening criteria that are based on total PCBs.
[+] Total DDx value for EPA EcoSSLs was used for 4,4-DDD, 4,4'DDE, and 4,4'-DDT.

Table 4-3
Former Dump Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Soils[3]		
															Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
1,4-Dichlorobenzene	106-46-7	VOCs	0.49	J	5600		µg/kg	SB05	4	570	11	195	5,000	1			
1,1,1-Trichloroethane	71-55-6	VOCs	2.7	J	2.7	J	µg/kg	SB02	4	570	1	195	160,000,000	0			
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/kg		4	570	0	195	1,000	0			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/kg		4	570	0	195	6,700,000	0			
1,1,2-Trichloroethane	79-00-5	VOCs	8.6	J	8.6	J	µg/kg	SB13	4	570	1	195	2,000	0			
1,1-Dichloroethane	75-34-3	VOCs	3.7	J	13	J	µg/kg	SB54	4	570	2	195	8,000	0			
1,1-Dichloroethene	75-35-4	VOCs					µg/kg		4	570	0	195	11,000	0			
1,2,3-Trichlorobenzene	87-61-6	VOCs	2.6	J	4.7	J	µg/kg	SB09	4	570	4	195	63,000	0			
1,2,4-Trichlorobenzene	120-82-1	VOCs	4.2	J	18	J+	µg/kg	SB13	4	570	8	195	73,000	0			
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/kg		4	570	0	195	80	0			
1,2-Dibromoethane	106-93-4	VOCs					µg/kg		4	570	0	195	8	0			
1,2-Dichlorobenzene	95-50-1	VOCs	0.25	J	5600		µg/kg	SB05	4	570	11	195	5,300,000	0			
1,2-Dichloroethane	107-06-2	VOCs	2.1	J	2.1	J	µg/kg	SB54	4	570	1	195	900	0			
1,2-Dichloropropane	78-87-5	VOCs					µg/kg		4	570	0	195	2,000	0			
1,3-Dichlorobenzene	541-73-1	VOCs	0.2	J	830		µg/kg	SB38	4	570	12	195	5,300,000	0			
2-Butanone	78-93-3	VOCs	13		470		µg/kg	SB54	7.9	1100	21	195	3,100,000	0			
2-Hexanone	591-78-6	VOCs					µg/kg		7.9	1100	0	195	200,000	0			
4-Methyl-2-pentanone	108-10-1	VOCs					µg/kg		7.9	1100	0	195	33,000,000	0			
Acetone	67-64-1	VOCs	1.7	J	1700	J	µg/kg	SB05	7.9	1100	80	195	70,000,000	0			
Benzene	71-43-2	VOCs	0.76	J	8	J	µg/kg	SB51	4	570	7	195	2,000	0			
Bromochloromethane	74-97-5	VOCs					µg/kg		4	570	0	195	150,000	0			
Bromodichloromethane	75-27-4	VOCs					µg/kg		4	570	0	195	1,000	0			
Bromoform	75-25-2	VOCs					µg/kg		4	570	0	195	81,000	0			
Bromomethane	74-83-9	VOCs					µg/kg		4	570	0	195	25,000	0			
Carbon Disulfide	75-15-0	VOCs	0.41	J	7.6	J	µg/kg	SB51	4	570	4	195	7,800,000	0			
Carbon Tetrachloride	56-23-5	VOCs	2	J	2	J	µg/kg	SB51	4	570	1	195	2,000	0			
Chlorobenzene	108-90-7	VOCs	0.43	J	14000		µg/kg	SB05	4	1700	15	195	510,000	0			
Chloroethane	75-00-3	VOCs					µg/kg		4	570	0	195	220,000	0			
Chloroform	67-66-3	VOCs	5.8		5.8		µg/kg	SB21	4	570	1	195	600	0			
Chloromethane	74-87-3	VOCs					µg/kg		4	570	0	195	4,000	0			
cis-1,2-Dichloroethene	156-59-2	VOCs	3	J	450		µg/kg	SB54	4	570	4	195	230,000	0			
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/kg		4	570	0	195	2,000	0			
Cyclohexane	110-82-7	VOCs					µg/kg		4	570	0	195	6,500,000	0			
Dibromochloromethane	124-48-1	VOCs					µg/kg		4	570	0	195	3,000	0			
Dichlorodifluoromethane	75-71-8	VOCs					µg/kg		4	570	0	195	490,000	0			
Ethylbenzene	100-41-4	VOCs	1.4	J	2800		µg/kg	SB05	4	570	5	195	7,800,000	0			
Isopropylbenzene	98-82-8	VOCs	2.1	J	12000		µg/kg	SB05	4	570	7	195	1,900,000	0			
Methyl acetate	79-20-9	VOCs	1.9	J	6.8		µg/kg	SB13	4	570	5	195	78,000,000	0			
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/kg		4	570	0	195	110,000	0			
Methylene Chloride	75-09-2	VOCs	0.2	J	1400	J	µg/kg	SB05	4	570	13	195	34,000	0			
Methylcyclohexane	108-87-2	VOCs	1.3	J	1700		µg/kg	SB05	4	570	5	195	NS	0			
Styrene	100-42-5	VOCs	0.91	J	0.91	J	µg/kg	SB50	4	570	1	209	90,000	0			
Tetrachloroethene	127-18-4	VOCs					µg/kg		4	570	0	209	43,000	0			
Toluene	108-88-3	VOCs	0.28	J	900		µg/kg	SB05	4	570	17	209	6,300,000	0			
trans-1,2-Dichloroethene	156-60-5	VOCs	30		30		µg/kg	SB54	4	570	1	209	300,000	0			
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/kg		4	570	0	209	2,000	0			
Trichloroethene	79-01-6	VOCs	0.53	J	83		µg/kg	S-092	4	570	4	209	3,000	0			
Trichlorofluoromethane	75-69-4	VOCs	0.2	J	2.1	J	µg/kg	SB51	4	570	3	209	23,000,000	0			
Vinyl Chloride	75-01-4	VOCs	46		46		µg/kg	SB54	4	570	1	209	700	0			
m,p-Xylene	179601-23-1	VOCs	3.1	J	13000		µg/kg	SB05	4	570	6	140	12,000,000	0			
o-Xylene	95-47-6	VOCs	3.4	J	18000		µg/kg	SB05	4	570	8	195	12,000,000	0			
Xylenes (TOTAL)	1330-20-7	VOCs					µg/kg		4.9	36	0	55	12,000,000	0			

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Table 4-3
Former Dump Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Background Soils[3]		
Analyte	**CAS #**	**Analyte Group**	**Minimum Result**	**Q**	**Maximum Result**	**Q**	**Unit**	**Location of Maximum**	**Minimum Reporting Detection Limit**	**Maximum Reporting Detection Limit**	**Number of Detects**	**Number of Samples**	**RI Screening Criteria[1]**	**Number of Exceedances[2]**	**Minimum Result**	**Maximum Result**	**Background Threshold Value (85% UTL)**
Benzo(a)pyrene	50-32-8	SVOCs	3.2	J	12000		µg/kg	SB13	3.4	220	39	82	500	2	7.3	1100	**1,329**
Dibenzo(a,h)anthracene	53-70-3	SVOCs	2.9	J	7300	J	µg/kg	SB13	3.4	200	30	82	500	2	3.7	260	**361**
Benzo(a)anthracene	56-55-3	SVOCs	3.4	J	14000	J	µg/kg	SB13	3.4	220	45	82	5,000	1	4.3	780	**780**
Benzo(b)fluoranthene	205-99-2	SVOCs	3.8		12000	J	µg/kg	SB13	3.4	220	44	82	5,000	1	4.1	1600	**1,600**
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs	2.9	J	9500	J	µg/kg	SB13	3.4	310	46	82	5,000	1	3	530	**530**
Benzo(k)fluoranthene	207-08-9	SVOCs	3.1	J	11000		µg/kg	SB13	3.4	220	45	82	45,000	0			
1,1'-Biphenyl	92-52-4	SVOCs	270		270		µg/kg	SB13	170	560	1	82	3,100,000	0			
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/kg		170	560	0	82	23,000	0			
1,4-Dioxane	123-91-1	SVOCs					µg/kg		79	11000	0	82	5,300	0			
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/kg		170	560	0	82	23,000	0			
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/kg		170	560	0	82	1,900,000	0			
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/kg		170	560	0	82	6,100,000	0			
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/kg		170	560	0	82	19,000	0			
2,4-Dichlorophenol	120-83-2	SVOCs					µg/kg		170	560	0	82	180,000	0			
2,4-Dimethylphenol	105-67-9	SVOCs					µg/kg		170	560	0	82	1,200,000	0			
2,4-Dinitrophenol	51-28-5	SVOCs					µg/kg		330	1100	0	82	120,000	0			
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/kg		170	560	0	82	700	0			
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/kg		170	560	0	82	700	0			
2-Chloronaphthalene	91-58-7	SVOCs					µg/kg		170	560	0	82	4,800,000	0			
2-Chlorophenol	95-57-8	SVOCs					µg/kg		170	560	0	82	310,000	0			
2-Methylnaphthalene	91-57-6	SVOCs	3.7	J	1400	J	µg/kg	SB13	3.3	310	27	82	230,000	0			
2-Methylphenol	95-48-7	SVOCs					µg/kg		170	560	0	82	310,000	0			
2-Nitroaniline	88-74-4	SVOCs					µg/kg		330	1100	0	82	39,000	0			
2-Nitrophenol	88-75-5	SVOCs					µg/kg		170	560	0	82	1,600	0			
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/kg		170	560	0	82	1,000	0			
3-Nitroaniline	99-09-2	SVOCs					µg/kg		330	1100	0	82	3,160	0			
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs	320	J	320	J	µg/kg	SB13	330	1100	1	82	6,000	0			
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/kg		170	560	0	82	NS	0			
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/kg		170	560	0	82	NS	0			
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/kg		170	560	0	82	6,300,000	0			
4-Chloroaniline	106-47-8	SVOCs	97	J	1900		µg/kg	SB13	170	560	5	82	2,700	0			
4-Methylphenol	106-44-5	SVOCs					µg/kg		170	560	0	82	31,000	0			
4-Nitroaniline	100-01-6	SVOCs					µg/kg		330	1100	0	82	27,000	0			
4-Nitrophenol	100-02-7	SVOCs					µg/kg		330	1100	0	82	5,120	0			
Acenaphthene	83-32-9	SVOCs	3.4	J	4400		µg/kg	SB13	3.3	210	14	82	3,400,000	0			
Acenaphthylene	208-96-8	SVOCs	3.5	J	180	J	µg/kg	SB23	3.3	210	16	82	682,000	0			
Acetophenone	98-86-2	SVOCs					µg/kg		170	560	0	82	2,000	0			
Anthracene	120-12-7	SVOCs	3.5	J	9700		µg/kg	SB13	3.3	310	29	82	17,000,000	0			
Atrazine	1912-24-9	SVOCs					µg/kg		170	560	0	82	210,000	0			
Benzaldehyde	100-52-7	SVOCs	180	J	190		µg/kg	SB47	170	560	2	82	6,100,000	0			
Benzo(g,h,i)perylene	191-24-2	SVOCs	3.1	J	8000	J	µg/kg	SB13	3.4	220	46	82	380,000,000	0			
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/kg		170	560	0	82	190,000	0			
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/kg		170	560	0	82	400	0			
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs	76	J	2800	J+	µg/kg	SB15	170	560	33	82	35,000	0			
Butylbenzylphthalate	85-68-7	SVOCs	110	J	2600		µg/kg	SB12	170	560	3	82	1,200,000	0			
Caprolactam	105-60-2	SVOCs					µg/kg		170	560	0	82	31,000,000	0			
Carbazole	86-74-8	SVOCs	210		5000		µg/kg	SB13	170	560	2	82	24,000	0			
Chrysene	218-01-9	SVOCs	4	J	14000		µg/kg	SB13	3.4	220	49	82	450,000	0			
Dibenzofuran	132-64-9	SVOCs	2200		2200		µg/kg	SB13	170	560	1	82	73,000	0			
Diethylphthalate	84-66-2	SVOCs	380		640		µg/kg	SB24	170	560	2	82	49,000,000	0			
Dimethylphthalate	131-11-3	SVOCs					µg/kg		170	560	0	82	734,000	0			
Di-n-butylphthalate	84-74-2	SVOCs	76	J	400		µg/kg	SB24	170	560	7	82	6,100,000	0			
Di-n-octylphthalate	117-84-0	SVOCs	87	J	87	J	µg/kg	SB11	170	560	1	82	2,400,000	0			
Fluoranthene	206-44-0	SVOCs	4		36000		µg/kg	SB13	3.4	310	45	82	2,300,000	0			
Fluorene	86-73-7	SVOCs	3	J	3000		µg/kg	SB13	3.3	210	16	82	2,300,000	0			

Table 4-3
Former Dump Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Background Soils[3]		
Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
Hexachlorobenzene	118-74-1	SVOCs					µg/kg		170	560	0	82	300	0			
Hexachlorobutadiene	87-68-3	SVOCs					µg/kg		170	560	0	82	6,000	0			
Hexachlorocyclopentadiene	77-47-4	SVOCs					µg/kg		170	560	0	82	45,000	0			
Hexachloroethane	67-72-1	SVOCs					µg/kg		170	560	0	82	35,000	0			
Isophorone	78-59-1	SVOCs					µg/kg		170	560	0	82	510,000	0			
Naphthalene	91-20-3	SVOCs	3.4	J	2200		µg/kg	SB13	3.3	310	27	82	6,000	0			
Nitrobenzene	98-95-3	SVOCs					µg/kg		170	560	0	82	31,000	0			
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					µg/kg		170	560	0	82	200	0			
N-Nitrosodiphenylamine	86-30-6	SVOCs					µg/kg		170	560	0	82	99,000	0			
Pentachlorophenol	87-86-5	SVOCs	4.7	J	120	J	µg/kg	SB41	6.8	430	5	82	900	0			
Phenanthrene	85-01-8	SVOCs	3	J	30000		µg/kg	SB13	3.4	310	51	82	45,700	0			
Phenol	108-95-2	SVOCs					µg/kg		170	560	0	82	18,000,000	0			
Pyrene	129-00-0	SVOCs	4.2	J	21000	J	µg/kg	SB13	3.4	220	46	82	1,700,000	0			
Aroclor 1254	11097-69-1	PCBs	7.2	J	2100	J	µg/kg	SB41	33	670	23	92	200	11	68	68	**68**
Aroclor 1260	11096-82-5	PCBs	10	J	2400		µg/kg	SB41	33	420	20	92	200	7	ND	ND	**ND**
Aroclor 1016	12674-11-2	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1221	11104-28-2	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1232	11141-16-5	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1242	53469-21-9	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1248	12672-29-6	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1262	37324-23-5	PCBs					µg/kg		33	110	0	92	200	0			
Aroclor 1268	11100-14-4	PCBs					µg/kg		33	110	0	92	200	0			
Endrin aldehyde	7421-93-4	Pesticides	2.7	J	25	J+	µg/kg	SB41	3.3	11	4	80	10.5	1	ND	ND	**ND**
4,4'-DDD	72-54-8	Pesticides	1.8	J	120	J+	µg/kg	SB15	3.3	27	14	80	3,000	0			
4,4'-DDE	72-55-9	Pesticides	0.87	J	140	J+	µg/kg	SB15	3.3	27	17	80	2,000	0			
4,4'-DDT	50-29-3	Pesticides	0.93	J	160		µg/kg	SB07	3.3	21	28	80	2,000	0			
Aldrin	309-00-2	Pesticides					µg/kg		1.7	5.6	0	80	40	0			
alpha-BHC	319-84-6	Pesticides					µg/kg		1.7	5.6	0	80	100	0			
alpha-Chlordane	5103-71-9	Pesticides	2.4	J	39	J	µg/kg	SB15	1.7	11	12	80	200	0			
beta-BHC	319-85-7	Pesticides					µg/kg		1.7	5.6	0	80	400	0			
delta-BHC	319-86-8	Pesticides	4.8	J	4.8	J	µg/kg	SB13	1.7	5.6	1	80	570	0			
Dieldrin	60-57-1	Pesticides	1.7	J	20	J	µg/kg	SB15	3.3	15	4	80	40	0			
Endosulfan I	959-98-8	Pesticides	0.45	J	4.4	J+	µg/kg	SB41	1.7	5.6	2	80	470,000	0			
Endosulfan II	33213-65-9	Pesticides	13	J	13	J	µg/kg	SB13	3.3	11	1	80	470,000	0			
Endosulfan Sulfate	1031-07-8	Pesticides					µg/kg		3.3	11	0	80	470,000	0			
Endrin	72-20-8	Pesticides	1.4	J	15	J	µg/kg	SB05	3.3	11	7	80	23,000	0			
Endrin Ketone	53494-70-5	Pesticides	9.1		9.1		µg/kg	SB23	3.3	11	1	80	NS	0			
gamma-BHC (Lindane)	58-89-9	Pesticides					µg/kg		1.7	5.6	0	80	400	0			
gamma-Chlordane	5103-74-2	Pesticides	2.1	J	43	J+	µg/kg	SB41	1.7	14	13	80	200	0			
Heptachlor	76-44-8	Pesticides	6.7	J+	7.4	J	µg/kg	SB15	1.7	5.6	2	80	100	0			
Heptachlor Epoxide	1024-57-3	Pesticides	13	J	13	J	µg/kg	SB15	1.7	12	1	80	70	0			
Methoxychlor	72-43-5	Pesticides	8.8	J	8.8	J	µg/kg	SB05	17	56	1	80	390,000	0			
Toxaphene	8001-35-2	Pesticides					µg/kg		170	560	0	80	600	0			
Chromium	7440-47-3	Metals	0.74	J	51.4		mg/kg	HA11	1	0.99	91	92	0.4	91	9.7	22.9	**24.21**
Lead	7439-92-1	Metals	1.7		442		mg/kg	SB41	1	0.99	92	92	400	1	8.9	121	**155.2**
Aluminum	7429-90-5	Metals	2100	J	33000		mg/kg	SB45	14.6	37	92	92	78,000	0			
Antimony	7440-36-0	Metals	0.29	J	2.6	J	mg/kg	SB13	4.4	11.1	83	92	31	0			
Arsenic	7440-38-2	Metals	0.37	J	12.6		mg/kg	HA13	1	0.99	92	92	19	0			
Barium	7440-39-3	Metals	24.9		402		mg/kg	HA13	14.6	37	92	92	16,000	0			
Beryllium	7440-41-7	Metals	0.14	J	0.98		mg/kg	SB31	0.36	0.92	80	92	16	0			
Cadmium	7440-43-9	Metals	0.04	J	71.5		mg/kg	SB23	0.36	0.92	60	92	78	0			
Calcium	7440-70-2	Metals	277	J	99600		mg/kg	SB34	365	4640	92	92	NS	0			
Cobalt	7440-48-4	Metals	0.68	J	10		mg/kg	SB07	3.6	9.2	90	92	1,600	0			
Copper	7440-50-8	Metals	1.3	J	545		mg/kg	SB13	1.8	4.6	92	92	3,100	0			

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Table 4-3
Former Dump Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Soils[3] Minimum Result	Background Soils[3] Maximum Result	Background Soils[3] Background Threshold Value (85% UTL)
Iron	7439-89-6	Metals	2830	J	45100		mg/kg	SB07	7.3	18.5	92	92	55,000	0			
Magnesium	7439-95-4	Metals	217	J	9190		mg/kg	SB02	365	924	92	92	NS	0			
Manganese	7439-96-5	Metals	6.4	J	3260		mg/kg	SB46	1.1	15.8	92	92	11,000	0			
Mercury	7439-97-6	Metals	0.01	J	9.2		mg/kg	SB46	0.088	0.59	58	92	23	0			
Nickel	7440-02-0	Metals	0.79	J	60.5		mg/kg	SB18	2.9	7.4	85	92	1,600	0			
Potassium	7440-09-7	Metals	37.2	J	1930		mg/kg	SB34	365	924	76	92	NS	0			
Selenium	7782-49-2	Metals	0.48	J	5.7		mg/kg	SB45	2.6	6.5	78	92	390	0			
Silver	7440-22-4	Metals	0.12	J	32.2		mg/kg	SB23	1	0.99	14	92	390	0			
Sodium	7440-23-5	Metals	45.4	J	282	J	mg/kg	SB12	365	924	78	92	NS	0			
Thallium	7440-28-0	Metals	0.23	J	0.76	J	mg/kg	SB46	1.8	4.6	10	92	5	0			
Vanadium	7440-62-2	Metals	4.4		45.6		mg/kg	SB-15G	3.6	9.2	91	92	78	0			
Zinc	7440-66-6	Metals	19.3		1670		mg/kg	SB13	4.4	11.1	92	92	23,000	0			

Notes:

1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.
3. Background samples were collected from unimpacted areas and utilized to calculate a background threshhold value (BTV) to compare to RI sampling results .

Acronyms:

J - estimated value
mg/kg - miligrams per kilogram
ND - analyte not detected in background samples
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
µg/kg - micrograms per kilogram

Table 4-4
Residential Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Soils[3] Minimum Result	Background Soils[3] Maximum Result	Background Soils[3] Background Threshold Value (85% UTL)
1,1,1-Trichloroethane	71-55-6	VOCs					µg/kg		4.6	8.9	0	16	160,000,000	0			
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/kg		4.6	8.9	0	16	1,000	0			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/kg		4.6	8.9	0	16	6,700,000	0			
1,1,2-Trichloroethane	79-00-5	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
1,1-Dichloroethane	75-34-3	VOCs					µg/kg		4.6	8.9	0	16	8,000	0			
1,1-Dichloroethene	75-35-4	VOCs					µg/kg		4.6	8.9	0	16	11,000	0			
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/kg		4.6	8.9	0	16	63,000	0			
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/kg		4.6	8.9	0	16	73,000	0			
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/kg		4.6	8.9	0	16	80	0			
1,2-Dibromoethane	106-93-4	VOCs					µg/kg		4.6	8.9	0	16	8	0			
1,2-Dichlorobenzene	95-50-1	VOCs					µg/kg		4.6	8.9	0	16	5,300,000	0			
1,2-Dichloroethane	107-06-2	VOCs					µg/kg		4.6	8.9	0	16	900	0			
1,2-Dichloropropane	78-87-5	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
1,3-Dichlorobenzene	541-73-1	VOCs					µg/kg		4.6	8.9	0	16	5,300,000	0			
1,4-Dichlorobenzene	106-46-7	VOCs					µg/kg		4.6	8.9	0	16	5,000	0			
2-Butanone	78-93-3	VOCs	3.3	J	12		µg/kg	SS-08	9.1	18	3	16	3,100,000	0			
2-Hexanone	591-78-6	VOCs					µg/kg		9.1	18	0	16	200,000	0			
4-Methyl-2-pentanone	108-10-1	VOCs					µg/kg		9.1	18	0	16	33,000,000	0			
Acetone	67-64-1	VOCs	6.2	J	26		µg/kg	SS-04	9.1	18	3	16	70,000,000	0			
Benzene	71-43-2	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
Bromochloromethane	74-97-5	VOCs					µg/kg		4.6	8.9	0	16	150,000	0			
Bromodichloromethane	75-27-4	VOCs					µg/kg		4.6	8.9	0	16	1,000	0			
Bromoform	75-25-2	VOCs					µg/kg		4.6	8.9	0	16	81,000	0			
Bromomethane	74-83-9	VOCs					µg/kg		4.6	8.9	0	16	25,000	0			
Carbon Disulfide	75-15-0	VOCs					µg/kg		4.6	8.9	0	16	7,800,000	0			
Carbon Tetrachloride	56-23-5	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
Chlorobenzene	108-90-7	VOCs					µg/kg		4.6	8.9	0	16	510,000	0			
Chloroethane	75-00-3	VOCs					µg/kg		4.6	8.9	0	16	220,000	0			
Chloroform	67-66-3	VOCs					µg/kg		4.6	8.9	0	16	600	0			
Chloromethane	74-87-3	VOCs					µg/kg		4.6	8.9	0	16	4,000	0			
cis-1,2-Dichloroethene	156-59-2	VOCs					µg/kg		4.6	8.9	0	16	230,000	0			
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
Cyclohexane	110-82-7	VOCs					µg/kg		4.6	8.9	0	16	6,500,000	0			
Dibromochloromethane	124-48-1	VOCs					µg/kg		4.6	8.9	0	16	3,000	0			
Dichlorodifluoromethane	75-71-8	VOCs					µg/kg		4.6	8.9	0	16	490,000	0			
Ethylbenzene	100-41-4	VOCs					µg/kg		4.6	8.9	0	16	7,800,000	0			
Isopropylbenzene	98-82-8	VOCs					µg/kg		4.6	8.9	0	16	1,900,000	0			
Methyl acetate	79-20-9	VOCs					µg/kg		4.6	8.9	0	16	78,000,000	0			
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/kg		4.6	8.9	0	16	110,000	0			
Methylene Chloride	75-09-2	VOCs					µg/kg		4.6	8.9	0	16	34,000	0			
Methylcyclohexane	108-87-2	VOCs					µg/kg		4.6	8.9	0	16	NS	0			
Styrene	100-42-5	VOCs					µg/kg		4.6	8.9	0	16	90,000	0			
Tetrachloroethene	127-18-4	VOCs					µg/kg		4.6	8.9	0	16	43,000	0			
Toluene	108-88-3	VOCs					µg/kg		4.6	8.9	0	16	6,300,000	0			
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/kg		4.6	8.9	0	16	300,000	0			
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/kg		4.6	8.9	0	16	2,000	0			
Trichloroethene	79-01-6	VOCs	0.96	J	5.3		µg/kg	SS-03	4.6	8.9	3	16	3,000	0			
Trichlorofluoromethane	75-69-4	VOCs					µg/kg		4.6	8.9	0	16	23,000,000	0			
Vinyl Chloride	75-01-4	VOCs					µg/kg		4.6	8.9	0	16	700	0			
m,p-Xylene	179601-23-1	VOCs					µg/kg		4.6	8.9	0	16	12,000,000	0			
o-Xylene	95-47-6	VOCs					µg/kg		4.6	8.9	0	16	12,000,000	0			
Benzo(a)pyrene	50-32-8	SVOCs	3.2	J	560	J+	µg/kg	SS-10	3.6	270	14	16	500	1	7.3	1100	**1329**
1,1'-Biphenyl	92-52-4	SVOCs					µg/kg		170	270	0	16	61,000	0			
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/kg		170	270	0	16	23,000	0			
1,4-Dioxane	123-91-1	SVOCs					µg/kg		78	140	0	16	5,300	0			
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/kg		170	530	0	16	23,000	0			
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/kg		170	270	0	16	1,900,000	0			
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/kg		170	270	0	16	6,100,000	0			
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/kg		170	270	0	16	19,000	0			
2,4-Dichlorophenol	120-83-2	SVOCs					µg/kg		170	270	0	16	180,000	0			
2,4-Dimethylphenol	105-67-9	SVOCs					µg/kg		170	270	0	16	1,200,000	0			
2,4-Dinitrophenol	51-28-5	SVOCs					µg/kg		340	530	0	16	120,000	0			
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/kg		170	270	0	16	700	0			
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/kg		170	270	0	16	700	0			

Table 4-4
Residential Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Background Soils[3]		
Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
2-Chloronaphthalene	91-58-7	SVOCs					µg/kg		170	270	0	16	4,800,000	0			
2-Chlorophenol	95-57-8	SVOCs					µg/kg		170	270	0	16	310,000	0			
2-Methylnaphthalene	91-57-6	SVOCs	7.8		31	J	µg/kg	SS-09	3.4	270	3	16	230,000	0			
2-Methylphenol	95-48-7	SVOCs					µg/kg		170	530	0	16	310,000	0			
2-Nitroaniline	88-74-4	SVOCs					µg/kg		200	500	0	16	39,000	0			
2-Nitrophenol	88-75-5	SVOCs					µg/kg		170	270	0	16	1,600	0			
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/kg		170	530	0	16	1,000	0			
3-Nitroaniline	99-09-2	SVOCs					µg/kg		340	530	0	16	3,160	0			
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs					µg/kg		340	530	0	16	6,000	0			
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/kg		170	270	0	16	NS	0			
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/kg		170	270	0	16	NS	0			
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/kg		170	270	0	16	6,300,000	0			
4-Chloroaniline	106-47-8	SVOCs					µg/kg		170	530	0	16	2,700	0			
4-Methylphenol	106-44-5	SVOCs					µg/kg		170	530	0	16	31,000	0			
4-Nitroaniline	100-01-6	SVOCs					µg/kg		340	530	0	16	27,000	0			
4-Nitrophenol	100-02-7	SVOCs	150	J	150	J	µg/kg	SB42	340	530	1	16	5,120	0			
Acenaphthene	83-32-9	SVOCs	5.5		5.5		µg/kg	SB43	3.4	270	1	16	3,400,000	0			
Acenaphthylene	208-96-8	SVOCs	3.8		63	J	µg/kg	SS-09	3.4	270	3	16	682,000	0			
Acetophenone	98-86-2	SVOCs	170	J	170	J	µg/kg	SB43	170	530	1	16	2,000	0			
Anthracene	120-12-7	SVOCs	8		54	J	µg/kg	SS-10	3.4	270	4	16	17,000,000	0			
Atrazine	1912-24-9	SVOCs					µg/kg		170	530	0	16	210,000	0			
Benzaldehyde	100-52-7	SVOCs	92	J	92	J	µg/kg	SB42/ SB43	170	530	2	16	6,100,000	0			
Benzo(a)anthracene	56-55-3	SVOCs	4.9		480	J+	µg/kg	SS-10	3.6	270	12	16	5,000	0			
Benzo(b)fluoranthene	205-99-2	SVOCs	4.2	J	1100	J+	µg/kg	SS-10	3.6	270	14	16	5,000	0			
Benzo(g,h,i)perylene	191-24-2	SVOCs	8		170	J+	µg/kg	SS-10	3.4	270	7	16	380,000,000	0			
Benzo(k)fluoranthene	207-08-9	SVOCs	3.7	J	440	J+	µg/kg	SS-10	3.6	270	13	16	45,000	0			
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/kg		170	270	0	16	190,000	0			
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/kg		170	530	0	16	400	0			
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs	29	J	280	J+	µg/kg	SS-04	170	270	7	16	35,000	0			
Butylbenzylphthalate	85-68-7	SVOCs					µg/kg		170	270	0	16	1,200,000	0			
Caprolactam	105-60-2	SVOCs					µg/kg		170	530	0	16	31,000,000	0			
Carbazole	86-74-8	SVOCs					µg/kg		170	530	0	16	24,000	0			
Chrysene	218-01-9	SVOCs	4.1		570	J+	µg/kg	SS-10	3.6	270	14	16	450,000	0			
Dibenzo(a,h)anthracene	53-70-3	SVOCs	4		50		µg/kg	SB43	3.4	270	5	16	500	0			
Dibenzofuran	132-64-9	SVOCs					µg/kg		170	270	0	16	73,000	0			
Diethylphthalate	84-66-2	SVOCs	310		310		µg/kg	SB42	170	270	1	16	49,000,000	0			
Dimethylphthalate	131-11-3	SVOCs					µg/kg		170	270	0	16	734,000	0			
Di-n-butylphthalate	84-74-2	SVOCs	230		290		µg/kg	SS-11	170	270	3	16	6,100,000	0			
Di-n-octylphthalate	117-84-0	SVOCs					µg/kg		170	530	0	16	2,400,000	0			
Fluoranthene	206-44-0	SVOCs	4		1000	J+	µg/kg	SS-10	3.6	530	15	16	2,300,000	0			
Fluorene	86-73-7	SVOCs	3	J	5.9		µg/kg	SB43	3.4	270	2	16	2,300,000	0			
Hexachlorobenzene	118-74-1	SVOCs					µg/kg		170	270	0	16	300	0			
Hexachlorobutadiene	87-68-3	SVOCs					µg/kg		170	270	0	16	6,000	0			
Hexachlorocyclopentadiene	77-47-4	SVOCs					µg/kg		170	530	0	16	45,000	0			
Hexachloroethane	67-72-1	SVOCs					µg/kg		170	270	0	16	12,000	0			
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs	4.7	J	160	J+	µg/kg	SS-10	3.6	270	8	16	5,000	0			
Isophorone	78-59-1	SVOCs					µg/kg		170	270	0	16	510,000	0			
Naphthalene	91-20-3	SVOCs	4.7		8.4		µg/kg	SB43	3.4	270	2	16	6,000	0			
Nitrobenzene	98-95-3	SVOCs					µg/kg		170	270	0	16	5,000	0			
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					µg/kg		170	270	0	16	200	0			
N-Nitrosodiphenylamine	86-30-6	SVOCs					µg/kg		170	270	0	16	99,000	0			
Pentachlorophenol	87-86-5	SVOCs	6.3	J	79	J	µg/kg	SB43	6.8	530	2	16	900	0			
Phenanthrene	85-01-8	SVOCs	3.3	J	350		µg/kg	SS-10	3.6	270	12	16	45,700	0			
Phenol	108-95-2	SVOCs					µg/kg		170	530	0	16	18,000,000	0			
Pyrene	129-00-0	SVOCs	6.4		1300	J+	µg/kg	SS-10	3.6	270	15	16	1,700,000	0			
Aroclor 1254	11097-69-1	PCBs	14	J	2800		µg/kg	HA07	36	770	18	38	200	11	68	68	**68**
Aroclor 1260	11096-82-5	PCBs	2.9	J	1800	J	µg/kg	HA17	36	770	20	38	200	10	ND	ND	**ND**
Aroclor 1016	12674-11-2	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1221	11104-28-2	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1232	11141-16-5	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1242	53469-21-9	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1248	12672-29-6	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1262	37324-23-5	PCBs					µg/kg		34	77	0	38	200	0			
Aroclor 1268	11100-14-4	PCBs					µg/kg		34	77	0	38	200	0			

Table 4-4
Residential Area Soils Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Soils[3]		
															Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
4,4'-DDD	72-54-8	Pesticides	0.3	J	34	J	µg/kg	SB43	3.4	5.4	4	16	3,000	0			
4,4'-DDE	72-55-9	Pesticides	0.58	J	34		µg/kg	SS-03	3.4	5.4	10	16	2,000	0			
4,4'-DDT	50-29-3	Pesticides	0.81	J	120		µg/kg	SB43	3.4	44	12	16	2,000	0			
Aldrin	309-00-2	Pesticides	0.33	J	0.43	J	µg/kg	SS-06	1.7	2.8	2	16	40	0			
alpha-BHC	319-84-6	Pesticides					µg/kg		1.7	2.8	0	16	100	0			
alpha-Chlordane	5103-71-9	Pesticides	0.57	J	55	J	µg/kg	SB43	1.7	23	9	16	200	0			
beta-BHC	319-85-7	Pesticides					µg/kg		1.7	2.8	0	16	400	0			
delta-BHC	319-86-8	Pesticides					µg/kg		1.7	2.8	0	16	570	0			
Dieldrin	60-57-1	Pesticides	2.4	J	13	J	µg/kg	SB42	3.4	5.4	3	16	40	0			
Endosulfan I	959-98-8	Pesticides	4.7	J+	4.7	J+	µg/kg	SS-11	1.7	2.8	1	16	470,000	0			
Endosulfan II	33213-65-9	Pesticides	2.9	J	2.9	J	µg/kg	SS-04	3.4	5.4	1	16	470,000	0			
Endosulfan Sulfate	1031-07-8	Pesticides	0.42	J	1.2	J	µg/kg	SS-05	3.4	5.4	2	16	470,000	0			
Endrin	72-20-8	Pesticides	0.57	J	35	J	µg/kg	SB43	3.4	5.4	6	16	23,000	0			
Endrin aldehyde	7421-93-4	Pesticides	0.55	J	2.2	J	µg/kg	SS-04	3.4	5.4	3	16	10.5	0			
Endrin Ketone	53494-70-5	Pesticides					µg/kg		3.4	5.4	0	16	NS	0			
gamma-BHC (Lindane)	58-89-9	Pesticides	7.8	J+	7.8	J+	µg/kg	SS-11	1.7	2.8	1	16	400	0			
gamma-Chlordane	5103-74-2	Pesticides	0.37	J	49		µg/kg	SB43	1.7	23	5	16	200	0			
Heptachlor	76-44-8	Pesticides					µg/kg		1.7	2.8	0	16	100	0			
Heptachlor Epoxide	1024-57-3	Pesticides					µg/kg		1.7	2.8	0	16	70	0			
Methoxychlor	72-43-5	Pesticides	1.2	J	270	J+	µg/kg	SS-11	17	28	11	16	390,000	0			
Toxaphene	8001-35-2	Pesticides					µg/kg		170	280	0	16	600	0			
Chromium	7440-47-3	Metals	3.6		278	J	mg/kg	HA09	0.88	0.95	38	38	0.4	38	9.7	22.9	**24.21**
Lead	7439-92-1	Metals	3.3		1460		mg/kg	SB42	0.44	0.95	38	38	400	7	8.9	121	**155.2**
Antimony	7440-36-0	Metals	0.32	J	67.1		mg/kg	SB42	0.88	11.5	13	38	31	1	0.27	1.7	**2.129**
Arsenic	7440-38-2	Metals	0.91		25.4		mg/kg	SB42	0.44	0.95	38	38	19	1	1.3	8.7	**10.03**
Aluminum	7429-90-5	Metals	4340	J	33000		mg/kg	SB45	15.8	38.4	26	26	78,000	0			
Barium	7440-39-3	Metals	31.1		728		mg/kg	HA06	4.4	38.4	37	38	16,000	0			
Beryllium	7440-41-7	Metals	0.26	J	0.87		mg/kg	HA18	0.44	0.96	21	38	16	0			
Cadmium	7440-43-9	Metals	0.072	J	2.2	J	mg/kg	HA08/HA09	0.44	0.96	30	38	78	0			
Calcium	7440-70-2	Metals	546		5150		mg/kg	HA18	394	1120	24	26	NS	0			
Cobalt	7440-48-4	Metals	2.9	J	11.4		mg/kg	SS-07	0.44	9.6	31	38	1,600	0			
Copper	7440-50-8	Metals	6.2		776	J	mg/kg	HA07	0.88	4.8	38	38	3,100	0			
Iron	7439-89-6	Metals	8300	J	33800		mg/kg	SB45	7.9	19.2	26	26	55,000	0			
Magnesium	7439-95-4	Metals	1070		2860		mg/kg	HA18	394	961	24	26	NS	0			
Manganese	7439-96-5	Metals	81.5	J	1690		mg/kg	SB43	0.44	2.9	38	38	11,000	0			
Mercury	7439-97-6	Metals	0.008	J	11.6		mg/kg	HA08	0.11	0.99	33	38	23	0			
Nickel	7440-02-0	Metals	5		41	J	mg/kg	HA07	0.44	7.7	37	38	1,600	0			
Potassium	7440-09-7	Metals	36.7	J	290	J	mg/kg	SB43	394	961	10	26	NS	0			
Selenium	7782-49-2	Metals	0.48	J	6.3		mg/kg	SB43	2.2	6.7	21	38	390	0			
Silver	7440-22-4	Metals	0.53	J	31.9	J	mg/kg	HA09	0.44	0.95	14	38	390	0			
Sodium	7440-23-5	Metals	50.3	J	175	J	mg/kg	SB45	394	961	18	26	NS	0			
Thallium	7440-28-0	Metals	0.37	J	0.82	J	mg/kg	SB45	0.44	4.8	4	38	5	0			
Vanadium	7440-62-2	Metals	12.3		60.2		mg/kg	SB45	2.2	9.6	38	38	78	0			
Zinc	7440-66-6	Metals	25.8		428	J	mg/kg	HA07	0.88	11.5	38	38	23,000	0			

Notes:
1. RI screening criteria are summarized on Table 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.
3. Background samples were collected from unimpacted areas and utilized to calculate a background threshhold value (BTV) to compare to RI sampling results .

Acronyms:
J - estimated value
mg/kg - miligrams per kilogram
ND - analyte not detected in background samples
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
µg/kg - micrograms per kilogram

Table 4-5
Round 2 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Trichloroethene	79-01-6	VOCs	0.24	J	180		µg/L	MLS-3	0.4	13	58	89	1	48
Vinyl Chloride	75-01-4	VOCs	0.026	J	39		µg/L	MLS-2	0.05	5	14	89	1	8
1,1,1-Trichloroethane	71-55-6	VOCs	0.24	J	120		ug/l	MLS-2	0.5	13	33	89	30	2
1,1-Dichloroethane	75-34-3	VOCs	0.16	J	160		µg/L	MLS-2	0.5	13	46	89	50	2
cis-1,2-Dichloroethene	156-59-2	VOCs	0.14	J	230		µg/L	MLS-2	0.5	13	62	89	70	2
Chloroethane	75-00-3	VOCs	59		87	J	µg/L	MLS-2	0.5	13	2	89	5	2
1,1-Dichloroethene	75-35-4	VOCs	1.3		1.3		µg/L	MLS-4	0.5	1	1	89	1	1
Bromodichloromethane	75-27-4	VOCs	1		1		µg/L	MLS-6	0.5	1	1	89	1	1
Chlorobenzene	108-90-7	VOCs	0.11	J	160		µg/L	MW-6	0.5	5	20	89	50	1
Tetrachloroethene	127-18-4	VOCs	0.14	J	2.2		µg/L	MLS-2	0.4	1	14	89	1	1
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	1	0	89	1	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	1	0	89	20000	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	1	0	89	3	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	1	0	89	0.02	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	1	0	89	0.03	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	1	0	89	7	0
1,2,4-Trichlorobenzene	120-82-1	VOCs	0.25	J	0.25	J	µg/L	MLS-8	0.5	1	1	89	9	0
1,2-Dichlorobenzene	95-50-1	VOCs	0.36	J	2.6		µg/L	MLS-2	0.5	1	11	89	600	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L	MLS-8	0.5	1	0	89	2	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L	MLS-8	0.5	1	0	89	1	0
1,3-Dichlorobenzene	541-73-1	VOCs	0.1	J	1.4		µg/L	MW-6	0.5	1	4	89	600	0
1,4-Dichlorobenzene	106-46-7	VOCs	0.75		4.5		µg/L	MW-6	0.5	1	10	89	75	0
2-Butanone	78-93-3	VOCs	2.8	J	5.1		µg/L	MLS-13	5	10	4	89	300	0
2-Hexanone	591-78-6	VOCs					µg/L		5	10	0	89	40	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	10	0	89	6300	0
Acetone	67-64-1	VOCs	1.8	J	29		µg/L	MLS-3	5	10	18	89	6000	0
Benzene	71-43-2	VOCs	0.56		0.86		µg/L	MW-6	0.2	1	8	89	1	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	1	0	89	83	0
Bromoform	75-25-2	VOCs					µg/L		0.5	1	0	89	4	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	1	0	89	10	0
Carbon Disulfide	75-15-0	VOCs	0.23	J	0.33		µg/L	OPZ-01	0.5	1	2	89	700	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	1	0	89	1	0
Chloroform	67-66-3	VOCs	1.4		6.1		µg/L	MLS-13	0.5	1	4	89	70	0
Chloromethane	74-87-3	VOCs	0.17	J	0.34		µg/L	MLS-13	0.5	1	3	89	190	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	1	0	89	1	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	1	0	89	13000	0
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	1	0	89	1	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	1	0	89	1000	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	1	0	89	700	0
Isopropylbenzene	98-82-8	VOCs	0.72		0.88	J	µg/L	MLS-2	0.5	1	2	89	700	0
m,p-Xylene	179601-23-1	VOCs	0.14	J	0.14	J	µg/L	MLS-13	0.5	1	1	89	1000	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	1	0	89	7000	0
Methyl tert-Butyl Ether	1634-04-4	VOCs	0.1	J	11	J	µg/L	MLS-11	0.5	1	2	89	70	0
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	1	0	89	100	0
Methylene Chloride	75-09-2	VOCs	0.12	J	0.13	J	µg/L	MLS-14	0.5	1	0	89	3	0
o-Xylene	95-47-6	VOCs	0.18	J	0.19	J	µg/L	MLS-6	0.5	1	2	89	1000	0
Styrene	100-42-5	VOCs					µg/L		0.5	1	0	89	100	0
Toluene	108-88-3	VOCs	0.1	J	150		µg/L	MW-15B	0.5	5	39	89	600	0
trans-1,2-Dichloroethene	156-60-5	VOCs	0.14	J	0.78		µg/L	MLS-4	0.5	1	10	89	100	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	1	0	89	1	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	1	0	89	2000	0

Table 4-5
Round 2 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
1,4-Dioxane (SW8270D SIM)	123-91-1	SVOCs	0.086	J	4.1		µg/L	MLS-3	0.17	0.21	74	89	0.4	32
1,4-Dioxane (E625)	123-91-1	SVOCs	0.92	J	7.3		µg/L	MLS-7	2	2.2	14	81	0.4	14
1,1'-Biphenyl	92-52-4	SVOCs					µg/L		5	5.6	0	81	400	0
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/L		5	5.6	0	81	1.7	0
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/L		10	11	0	81	300	0
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/L		5	5.6	0	81	200	0
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/L		5	5.6	0	81	700	0
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/L		5	5.6	0	81	20	0
2,4-Dichlorophenol	120-83-2	SVOCs					µg/L		5	5.6	0	81	20	0
2,4-Dimethylphenol	105-67-9	SVOCs					µg/L		5	5.6	0	81	100	0
2,4-Dinitrophenol	51-28-5	SVOCs					µg/L		10	11	0	81	40	0
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/L	MLS-11	5	5.6	0	81	0.24	0
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/L	MLS-11	5	5.6	0	81	0.049	0
2-Chloronaphthalene	91-58-7	SVOCs					µg/L		5	5.6	0	81	600	0
2-Chlorophenol	95-57-8	SVOCs					µg/L	MLS-11	5	5.6	0	81	40	0
2-Methylnaphthalene	91-57-6	SVOCs					µg/L		5	5.6	0	81	30	0
2-Methylphenol	95-48-7	SVOCs					µg/L	MLS-11	10	11	0	81	50	0
2-Nitroaniline	88-74-4	SVOCs					µg/L		5	5.6	0	81	190	0
2-Nitrophenol	88-75-5	SVOCs	2.8	J	2.8	J	µg/L	MLS-13	5	5.6	1	81	100	0
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/L		10	11	0	81	30	0
3-Nitroaniline	99-09-2	SVOCs					µg/L		10	11	0	81	100	0
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs					µg/L		10	11	0	81	0.7	0
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/L		5	5.6	0	81	100	0
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/L		5	5.6	0	81	100	0
4-Chloroaniline	106-47-8	SVOCs					µg/L		10	11	0	81	30	0
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/L		5	5.6	0	81	100	0
4-Methylphenol	106-44-5	SVOCs	2.5	J	2.5	J	µg/L	MLS-1	10	11	1	81	50	0
4-Nitroaniline	100-01-6	SVOCs					µg/L		10	11	0	81	3.8	0
4-Nitrophenol	100-02-7	SVOCs	3.2	J	3.2	J	µg/L	MLS-13	10	11	1	81	100	0
Acenaphthene	83-32-9	SVOCs					µg/L		5	5.6	0	81	400	0
Acenaphthylene	208-96-8	SVOCs					µg/L		5	5.6	0	81	100	0
Acetophenone	98-86-2	SVOCs					µg/L		10	11	0	81	700	0
Anthracene	120-12-7	SVOCs					µg/L		5	5.6	0	81	2000	0
Atrazine	1912-24-9	SVOCs					µg/L		10	11	0	81	3	0
Benzaldehyde	100-52-7	SVOCs					µg/L		10	11	0	81	19	0
Benzo(a)anthracene	56-55-3	SVOCs					µg/L		5	5.6	0	81	0.1	0
Benzo(a)pyrene	50-32-8	SVOCs					µg/L		5	5.6	0	81	0.1	0
Benzo(b)fluoranthene	205-99-2	SVOCs					µg/L		5	5.6	0	81	0.2	0
Benzo(g,h,i)perylene	191-24-2	SVOCs					µg/L		5	5.6	0	81	100	0
Benzo(k)fluoranthene	207-08-9	SVOCs					µg/L		5	5.6	0	81	0.5	0
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/L		5	5.6	0	81	59	0
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs	1.4	J	1.7	J	µg/L	MW-11	5	5.6	2	81	3	0
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/L		10	11	0	81	7	0
Butylbenzylphthalate	85-68-7	SVOCs					µg/L		5	5.6	0	81	100	0
Caprolactam	105-60-2	SVOCs	0.97	J	37		µg/L	MLS-9	10	11	14	81	4000	0
Carbazole	86-74-8	SVOCs					µg/L		10	11	0	81	100	0
Chrysene	218-01-9	SVOCs					µg/L		5	5.6	0	81	5	0
Dibenzo(a,h)anthracene	53-70-3	SVOCs					µg/L		5	5.6	0	81	0.3	0
Dibenzofuran	132-64-9	SVOCs					µg/L		5	5.6	0	81	7.9	0
Diethylphthalate	84-66-2	SVOCs					µg/L		5	5.6	0	81	6000	0
Dimethylphthalate	131-11-3	SVOCs					µg/L		5	5.6	0	81	100	0

Table 4-5
Round 2 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Di-n-butylphthalate	84-74-2	SVOCs					µg/L		5	5.6	0	81	700	0
Di-n-octylphthalate	117-84-0	SVOCs					µg/L		10	11	0	81	100	0
Fluoranthene	206-44-0	SVOCs					µg/L		10	11	0	81	300	0
Fluorene	86-73-7	SVOCs					µg/L		5	5.6	0	81	300	0
Hexachlorobenzene	118-74-1	SVOCs					µg/L		5	5.6	0	81	0.02	0
Hexachlorobutadiene	87-68-3	SVOCs					µg/L		5	5.6	0	81	1	0
Hexachlorocyclopentadiene	77-47-4	SVOCs					µg/L		10	11	0	81	40	0
Hexachloroethane	67-72-1	SVOCs					µg/L		5	5.6	0	81	7	0
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs					µg/L		5	5.6	0	81	0.2	0
Isophorone	78-59-1	SVOCs					µg/L		5	5.6	0	81	40	0
Naphthalene	91-20-3	SVOCs	5	J	5	J	µg/L	MLS-1	5	5.6	1	81	300	0
Nitrobenzene	98-95-3	SVOCs					µg/L		5	5.6	0	81	6	0
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					µg/L		5	5.6	0	81	10	0
N-Nitrosodiphenylamine	86-30-6	SVOCs					µg/L		5	5.6	0	81	10	0
Pentachlorophenol	87-86-5	SVOCs					µg/L		10	11	0	81	0.3	0
Phenanthrene	85-01-8	SVOCs					µg/L		5	5.6	0	81	100	0
Phenol	108-95-2	SVOCs	1.8	J	38		µg/L	MLS-13	10	11	5	81	2000	0
Pyrene	129-00-0	SVOCs					µg/L		5	5.6	0	81	200	0
Lead	7439-92-1	Metals	3.2		9.5		µg/L	MLS-13	1	1	3	3	5	1
Manganese	7439-96-5	Metals	3.2		71		µg/L	MLS-9	1	1	3	3	50	1
Aluminum	7429-90-5	Metals					µg/L		20	20	0	3	200	0
Antimony	7440-36-0	Metals					µg/L		1	1	0	3	6	0
Arsenic	7440-38-2	Metals					µg/L		1	1	0	3	3	0
Barium	7440-39-3	Metals	11		53		µg/L	MLS-3	1	1	3	3	2000	0
Beryllium	7440-41-7	Metals					µg/L		1	1	0	3	1	0
Cadmium	7440-43-9	Metals					µg/L		1	1	0	3	4	0
Calcium	7440-70-2	Metals	20000		40000		µg/L	MLS-13	100	100	3	3	NS	0
Chromium	7440-47-3	Metals					µg/L		1	1	0	3	70	0
Cobalt	7440-48-4	Metals					µg/L		1	1	0	3	100	0
Copper	7440-50-8	Metals	2.7		2.7		µg/L	MLS-13	1	1	1	3	1300	0
Iron	7439-89-6	Metals	96		96		µg/L	MLS-9	20	20	1	3	300	0
Magnesium	7439-95-4	Metals	3800		16000		µg/L	MLS-9	100	100	3	3	NS	0
Mercury	7439-97-6	Metals					µg/L		0.2	0.2	0	3	0.002	0
Nickel	7440-02-0	Metals					µg/L		1	1	0	3	100	0
Potassium	7440-09-7	Metals	410		1800		µg/L	MLS-13MLS-13	100	100	3	3	NS	0
Selenium	7782-49-2	Metals					µg/L		2	2	0	3	40	0
Silver	7440-22-4	Metals					µg/L		1	1	0	3	40	0
Sodium	7440-23-5	Metals	4800		16000		µg/L	MLS-13MLS-13	100	100	3	3	50000	0
Thallium	7440-28-0	Metals					µg/L		1	1	0	3	2	0

Table 4-5
Round 2 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Vanadium	7440-62-2	Metals	2.4		2.4		µg/L	MLS-9	1	1	1	3	86	0
Zinc	7440-66-6	Metals	5.2		26		µg/L	MLS-9	2	2	3	3	2000	0
Chloride	16887-00-6	Misc	1.5		1400		mg/L	MW-9	0.5	20	83	83	NS	0
Ethane	74-84-0	Misc	2.77		5.84		mg/L	MLS-2	2	2	4	83	NS	0
Ethene	74-85-1	Misc	4.32		27		µg/L	MLS-2	2	2	3	83	NS	0
Methane	74-82-8	Misc	2.2		3010		µg/L	MLS-1	2	200	64	83	NS	0
Nitrate + Nitrite [As N]	NN	Misc	0.07		6.8		mg/L	MW-5	0.05	0.5	51	83	NS	0
Sulfate	14808-79-8	Misc	5.8		86		mg/L	MW-15B	1	1	83	83	NS	0
Sulfide	18496-25-8	Misc	0.011		0.028		mg/L	MLS-1	0.01	0.01	10	83	NS	0
Total Organic Carbon	TOC	Misc	1		9.5		mg/L	MW-6	1	1	32	83	NS	0
1,1 DCA reductase	DCA	DNA					cells/mL		4.6	5.1	0	14	NS	0
1,2 DCA Reductase	DCAR	DNA					cells/mL		4.6	5.1	0	14	NS	0
BVCA	BVCA	DNA	0.4	J	539		cells/mL	MLS-3	0.5	0.5	4	14	NS	0
Chloroform reductase	CFR	DNA	191		191		cells/mL	MLS-3	4.6	5.1	1	14	NS	0
cis-DCE	13C12C-CDCE	DNA	-47.7		-21.4		VPDB	MLS-6MLS-7			14	14	NS	0
DCM Reductase	DCMA	DNA					cells/mL		4.6	5.1	0	14	NS	0
Dehalobacter DCM	DCM	DNA					cells/mL		4.6	5.1	0	14	NS	0
Dehalobacter spp.	DHBT	DNA	114		59800		cells/mL	MLS-4	4.6	5.1	11	14	NS	0
Dehalobium spp.	DECO	DNA	40		7960		cells/mL	MLS-6	4.6	5.1	10	14	NS	0
Dehalococcoides spp.	DHC	DNA	0.4	J	2720		cells/mL	MLS-3	0.5	0.5	6	14	NS	0
Dehalogenimonas spp.	DHG	DNA	665		665		cells/mL	MLS-7	4.6	5.1	1	14	NS	0
Desulfitobacterium spp.	DSB	DNA	94.1		81700		cells/mL	MLS-4	4.6	5.1	11	14	NS	0
Desulfuromonas spp.	DSM	DNA	20.4		56.1		cells/mL	MLS-4	4.6	5.1	2	14	NS	0
Epoxyalkane transferase	ETNE	DNA	229		229		cells/mL	MLS-3	4.6	5.1	1	14	NS	0
Ethene Monooxygenase	ETNC	DNA	45.2		45.2		cells/mL	MLS-3	4.6	5.1	1	14	NS	0
MGN	MGN	DNA	0.2	J	2500		cells/mL	MLS-7	4.6	5.1	11	14	NS	0
Particulate methane monooxygenase	PMMO	DNA	9.6		15.1		cells/mL	MLS-13	4.6	5.1	2	14	NS	0
PCE	13C12C-PCE	DNA	-35.3		-35.3		VPDB	MLS-4	10.0	10.0	1	4	NS	0
Phenol Hydroxylase	PHE	DNA	2.5	J	1370		cells/mL	MLS-7	4.6	5.1	12	14	NS	0
Solublemethanemonooxygenase	SMMO	DNA	25.4		124		cells/mL	MLS-3	4.6	5.1	6	14	NS	0
Sulfate Reducing Bacteria	APS	DNA	379		507000		cells/mL	MLS-9	4.6	5.1	11	14	NS	0
TCE	13C12C-TCE	DNA	-56.5		-18.5		VPDB	MLS-7			14	14	NS	0
TCEA	TCEA	DNA	0.8		0.8		cells/mL	MLS-7	0.5	0.5	1	14	NS	0
Tetra-Trichlorobenzene Dioxygenase	TCBO	DNA	38.7		177		cells/mL	MLS-4	4.6	5.1	2	14	NS	0
Toluene Dioxygenase	TOD	DNA	700		2230		cells/mL	MLS-3	4.6	5.1	6	14	NS	0
Toluene Monooxygenase	RMO	DNA	35.9		3860		cells/mL	MLS-7	4.6	5.1	7	14	NS	0
Toluene Monooxygenase 2	RDEG	DNA	97.7		8610		cells/mL	MLS-4	4.6	5.1	10	14	NS	0
Total Eubacteria	EBAC	DNA	252		2080000		cells/mL	MLS-4	4.6	5.1	14	14	NS	0
VC	13C12C-VC	DNA	-56.1		-9.1		VPDB	MLS-6			2	2	NS	0
VCRA	VCRA	DNA	130		130		cells/mL	MLS-3	0.5	0.5	1	14	NS	0

Notes:
1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:

cells/mL - cells per mililiter
J - estimated value
mg/L - milligrams per liter
ND - analyte not detected in background samples
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier
R - rejected data
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
VPDB - Vienna Pee Dee Belemnite
µg/L - micrograms per liter

Table 4-6
Round 2 – Residential Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Trichloroethene	79-01-6	VOCs	0.31	J	76		µg/L	BYR-DW126	0.5	5	19	34	1	17
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	0.5	0	34	1	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	34	20000	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	34	3	0
1,1-Dichloroethane	75-34-3	VOCs	0.14	J	1.2		µg/L	BYR-DW115	0.5	0.5	13	34	50	0
1,1-Dichloroethene	75-35-4	VOCs					µg/L		0.5	0.5	0	34	1	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	34	7	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	34	9	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	34	0.02	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	34	0.03	0
1,2-Dichlorobenzene	95-50-1	VOCs					µg/L		0.5	0.5	0	34	600	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	34	2	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	34	1	0
1,3-Dichlorobenzene	541-73-1	VOCs					µg/L		0.5	0.5	0	34	600	0
1,4-Dichlorobenzene	106-46-7	VOCs					µg/L		0.5	0.5	0	34	75	0
2-Butanone	78-93-3	VOCs					µg/L		5	5	0	34	300	0
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	34	40	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	34	6300	0
Acetone	67-64-1	VOCs	2.8	J	4.7	J	µg/L	BYR-DW114	5	5	5	34	6000	0
Benzene	71-43-2	VOCs					µg/L		0.5	0.5	0	34	1	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	34	83	0
Bromodichloromethane	75-27-4	VOCs					µg/L		0.5	0.5	0	34	1	0
Bromoform	75-25-2	VOCs					µg/L		0.5	0.5	0	34	4	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	34	10	0
Carbon Disulfide	75-15-0	VOCs					µg/L		0.5	0.5	0	34	700	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	34	1	0
Chlorobenzene	108-90-7	VOCs					µg/L		0.5	0.5	0	34	50	0
Chloroethane	75-00-3	VOCs					µg/L		0.5	0.5	0	34	5	0
Chloroform	67-66-3	VOCs					µg/L		0.5	0.5	0	34	70	0
Chloromethane	74-87-3	VOCs	0.17	J	0.28	J	µg/L	BYR-DW117	0.5	0.5	15	34	190	0
cis-1,2-Dichloroethene	156-59-2	VOCs	0.28	J	67		µg/L	BYR-DW126	0.5	5	23	34	70	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	34	1	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	34	13000	0
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	0.5	0	34	1	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	34	1000	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	34	700	0
Isopropylbenzene	98-82-8	VOCs					µg/L		0.5	0.5	0	34	700	0
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	34	1000	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	34	7000	0
Methyl tert-Butyl Ether	1634-04-4	VOCs	0.15	J	0.15	J	µg/L	BYR-DW124	0.5	0.5	1	34	70	0
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	0.5	0	34	100	0
Methylene Chloride	75-09-2	VOCs	0.11	J	0.15	J	µg/L	BYR-DW125	0.5	0.5	5	34	3	0

Table 4-6
Round 2 – Residential Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
o-Xylene	95-47-6	VOCs					µg/L		0.5	0.5	0	34	1000	0
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	34	100	0
Tetrachloroethene	127-18-4	VOCs					µg/L		0.5	0.5	0	34	1	0
Toluene	108-88-3	VOCs					µg/L		0.5	0.5	0	34	600	0
trans-1,2-Dichloroethene	156-60-5	VOCs	0.16	J	0.99		µg/L	BYR-DW115	0.5	0.5	8	34	100	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	34	1	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	34	2000	0
Vinyl Chloride	75-01-4	VOCs					µg/L		0.5	0.5	0	34	1	0
1,4-Dioxane	123-91-1	SVOCs	0.091	J	0.39	J+	µg/L	BYR-DW125	0.18	0.2	20	36	0.4	0

Notes:

1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:

J - estimated value
Q - data qualifier
SVOCs- semi-volatile organic compounds
VOCs - volatile organic compounds
µg/L - micrograms per liter

Table 4-7
Round 3 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Trichloroethene	79-01-6	VOCs	0.037	J	190		µg/L	MLS-3	0.4	10	67	78	1	46
1,4-Dioxane	123-91-1	SVOCs	0.19	J	2.3	J-	µg/L	MLS-13	0.38	2	36	42	0.4	7
Vinyl Chloride	75-01-4	VOCs	0.011	J	44		µg/L	MLS-2	0.1	10	34	78	1	6
1,1-Dichloroethene	75-35-4	VOCs	0.2	J	5.4		µg/L	MLS-2	0.5	0.5	29	78	1	4
Chloroethane	75-00-3	VOCs	0.18	J	87		µg/L	MLS-2	0.5	10	7	78	5	3
1,1,1-Trichloroethane	71-55-6	VOCs	0.26	J	160		µg/L	MLS-2	0.5	10	33	78	30	2
Tetrachloroethene	127-18-4	VOCs	0.03	J	3.6		µg/L	MLS-2	0.4	0.5	32	78	1	3
1,1-Dichloroethane	75-34-3	VOCs	0.11	J	170		µg/L	MLS-2	0.5	10	52	78	50	2
cis-1,2-Dichloroethene	156-59-2	VOCs	0.27	J	240		µg/L	MLS-2	0.5	10	60	78	70	2
Chlorobenzene	108-90-7	VOCs	0.15	J	52		µg/L	MLS-7	0.5	5	22	78	50	1
1,1,2,2-Tetrachloroethane	79-34-5	VOCs	0.4	J	0.4	J	µg/L	MLS-7	0.5	0.5	1	78	1	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	78	20000	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	78	3	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	78	7	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	78	9.00	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	78	0.02	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	78	0	0
1,2-Dichlorobenzene	95-50-1	VOCs	0.16	J	5		µg/L	MLS-2	0.5	0.5	11	78	600	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	78	2	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	78	1	0
1,3-Dichlorobenzene	541-73-1	VOCs	0.14	J	0.4	J	µg/L	MLS-6	0.5	0.5	5	78	600	0
1,4-Dichlorobenzene	106-46-7	VOCs	0.13	J	2.8		µg/L	MLS-6	0.5	0.5	11	78	75	0
2-Butanone	78-93-3	VOCs	2.6	J	7.1		µg/L	MLS-13	5	5	7	78	300	0
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	78	40	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	78	6300	0
Acetone	67-64-1	VOCs	5.4		8.8	J	µg/L	MLS-13	5	19	3	78	6000	0
Benzene	71-43-2	VOCs	0.018	J	0.79		µg/L	MLS-6	0.2	0.5	42	78	1	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	78	83	0
Bromodichloromethane	75-27-4	VOCs	0.28	J	0.37	J	µg/L	BYR-DW139	0.5	0.5	3	78	1	0

Table 4-7
Round 3 – Monitoring Well Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Bromoform	75-25-2	VOCs	0.47	J	0.47	J	µg/L	BYR-DW139	0.5	0.5	1	78	4	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	78	10	0
Carbon Disulfide	75-15-0	VOCs	0.17	J	0.17	J	µg/L	MW-15B	0.5	0.5	1	78	700	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	78	1	0
Chloroform	67-66-3	VOCs	0.21	J	2.4		µg/L	MLS-13	0.5	0.5	16	78	70	0
Chloromethane	74-87-3	VOCs	0.35	J	0.35	J	µg/L	MLS-1	0.5	0.5	1	78	190	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	78	1	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	78	13000	0
Dibromochloromethane	124-48-1	VOCs	0.58		0.58		µg/L	BYR-DW139	0.5	0.5	1	78	1	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	78	1000	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	78	700	0
Isopropylbenzene	98-82-8	VOCs	0.94		1.8		µg/L	MLS-2	0.5	0.5	2	78	700	0
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	78	1000	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	78	7000	0
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/L		0.5	0.5	0	78	70	0
Methylcyclohexane	108-87-2	VOCs	0.29	J	0.29	J	µg/L	MLS-2	0.5	0.5	1	78	100	0
Methylene Chloride	75-09-2	VOCs					µg/L		0.5	0.5	0	78	3	0
o-Xylene	95-47-6	VOCs	0.11	J	0.11	J	µg/L	MLS-2	0.5	0.5	1	78	1000	0
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	78	100	0
Toluene	108-88-3	VOCs	0.15	J	22		µg/L	MLS-14	0.5	2.5	31	78	600	0
trans-1,2-Dichloroethene	156-60-5	VOCs	0.095	J	0.9		µg/L	MLS-4	0.5	0.5	17	78	100	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	78	1	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	78	2000	0

Notes:

1. RI screening criteria are summarized on Tables 4-1 through 4-2.

2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:

J - estimated value
Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
µg/L - micrograms per liter

Table 4-8a
Seep Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Trichloroethene	79-01-6	VOCs	1.5		1.5		µg/L	SEEP02	0.5	0.5	1	2	1	1
1,1,1-Trichloroethane	71-55-6	VOCs					µg/L		0.5	0.5	0	2	76	0
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	0.5	0	2	0.17	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	2	1	0
1,1-Dichloroethane	75-34-3	VOCs					µg/L		0.5	0.5	0	2	47	0
1,1-Dichloroethene	75-35-4	VOCs					µg/L		0.5	0.5	0	2	5	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	2	8	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	2	21	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,2-Dichlorobenzene	95-50-1	VOCs					µg/L		0.5	0.5	0	2	14	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	2	0.29	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	2	0.5	0
1,3-Dichlorobenzene	541-73-1	VOCs					µg/L		0.5	0.5	0	2	38	0
1,4-Dichlorobenzene	106-46-7	VOCs					µg/L		0.5	0.5	0	2	9	0
2-Butanone	78-93-3	VOCs					µg/L		5	5	0	2	14000	0
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	2	99	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	2	170	0
Acetone	67-64-1	VOCs					µg/L		5	5	0	2	1500	0
Benzene	71-43-2	VOCs					µg/L		0.5	0.5	0	2	0.15	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	2	NS	0
Bromodichloromethane	75-27-4	VOCs					µg/L		0.5	0.5	0	2	0.55	0
Bromoform	75-25-2	VOCs					µg/L		0.5	0.5	0	2	4.3	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	2	16	0
Carbon Disulfide	75-15-0	VOCs					µg/L		0.5	0.5	0	2	0.92	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	2	0.23	0
Chlorobenzene	108-90-7	VOCs					µg/L		0.5	0.5	0	2	47	0
Chloroethane	75-00-3	VOCs					µg/L		0.5	0.5	0	2	NS	0
Chloroform	67-66-3	VOCs					µg/L		0.5	0.5	0	2	6	0
Chloromethane	74-87-3	VOCs					µg/L		0.5	0.5	0	2	NS	0
cis-1,2-Dichloroethene	156-59-2	VOCs	1.6		1.6		µg/L	SEEP02	0.5	0.5	1	2	NS	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	2	0.06	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	2	NS	0
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	0.5	0	2	0.4	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	2	NS	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	2	14	0
Isopropylbenzene	98-82-8	VOCs					µg/L		0.5	0.5	0	2	3	0
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	2	27	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	2	NS	0
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/L		0.5	0.5	0	2	70	0
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	0.5	0	2	NS	0
Methylene Chloride	75-09-2	VOCs					µg/L		0.5	0.5	0	2	3	0
o-Xylene	95-47-6	VOCs					µg/L		0.5	0.5	0	2	27	0
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	2	32	0
Tetrachloroethene	127-18-4	VOCs					µg/L		0.5	0.5	0	2	0.34	0
Toluene	108-88-3	VOCs					µg/L		0.5	0.5	0	2	253	0

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/L		0.5	0.5	0	2	140	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	2	0.06	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	2	NS	0
Vinyl Chloride	75-01-4	VOCs					µg/L		0.5	0.5	0	2	0.025	0
1,1'-Biphenyl	92-52-4	SVOCs					µg/L		5	5	0	1	14	0
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/L		5	5	0	1	0.97	0
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/L		5	5	0	1	1400	0
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/L		5	5	0	1	1.2	0
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/L		5	5	0	1	1800	0
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/L		5	5	0	1	0.58	0
2,4-Dichlorophenol	120-83-2	SVOCs					µg/L		5	5	0	1	11	0
2,4-Dimethylphenol	105-67-9	SVOCs					µg/L		5	5	0	1	100	0
2,4-Dinitrophenol	51-28-5	SVOCs					µg/L		10	10	0	1	19	0
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/L		5	5	0	1	0.11	0
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/L		5	5	0	1	81	0
2-Chloronaphthalene	91-58-7	SVOCs					µg/L		5	5	0	1	0.396	0
2-Chlorophenol	95-57-8	SVOCs					µg/L		5	5	0	1	24	0
2-Methylnaphthalene	91-57-6	SVOCs					µg/L		0.1	0.1	0	1	330	0
2-Methylphenol	95-48-7	SVOCs					µg/L		5	5	0	1	13	0
2-Nitroaniline	88-74-4	SVOCs					µg/L		10	10	0	1	NS	0
2-Nitrophenol	88-75-5	SVOCs					µg/L		5	5	0	1	1920	0
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/L		5	5	0	1	0.021	0
3-Nitroaniline	99-09-2	SVOCs					µg/L		10	10	0	1	NS	0
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs					µg/L		10	10	0	1	13	0
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/L		5	5	0	1	1.5	0
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/L		5	5	0	1	NS	0
4-Chloroaniline	106-47-8	SVOCs					µg/L		5	5	0	1	232	0
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/L		5	5	0	1	NS	0
4-Methylphenol	106-44-5	SVOCs					µg/L		5	5	0	1	543	0
4-Nitroaniline	100-01-6	SVOCs					µg/L		10	10	0	1	NS	0
4-Nitrophenol	100-02-7	SVOCs					µg/L		10	10	0	1	60	0
Acenaphthene	83-32-9	SVOCs					µg/L		0.1	0.1	0	1	38	0
Acenaphthylene	208-96-8	SVOCs					µg/L		0.1	0.1	0	1	4840	0
Acetophenone	98-86-2	SVOCs					µg/L		5	5	0	1	NS	0
Anthracene	120-12-7	SVOCs					µg/L		0.1	0.1	0	1	0.035	0
Atrazine	1912-24-9	SVOCs					µg/L		5	5	0	1	1.8	0
Benzaldehyde	100-52-7	SVOCs					µg/L		5	5	0	1	NS	0
Benzo(a)anthracene	56-55-3	SVOCs					µg/L		0.1	0.1	0	1	0.0038	0
Benzo(a)pyrene	50-32-8	SVOCs					µg/L		0.1	0.1	0	1	0.0038	0
Benzo(b)fluoranthene	205-99-2	SVOCs					µg/L		0.1	0.1	0	1	0.0038	0
Benzo(g,h,i)perylene	191-24-2	SVOCs	0.12	J	0.12	J	µg/L	SEEP01	0.1	0.1	1	1	7.64	0
Benzo(k)fluoranthene	207-08-9	SVOCs					µg/L		0.1	0.1	0	1	0.0038	0
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/L		5	5	0	1	NS	0
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/L		5	5	0	1	0.03	0
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs					µg/L		5	5	0	1	0.3	0
Butylbenzylphthalate	85-68-7	SVOCs					µg/L		5	5	0	1	23	0
Caprolactam	105-60-2	SVOCs					µg/L		5	5	0	1	NS	0

Table 4-8a
Seep Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Carbazole	86-74-8	SVOCs					μg/L		5	5	0	1	NS	0
Chrysene	218-01-9	SVOCs					μg/L		0.1	0.1	0	1	0.0038	0
Dibenzo(a,h)anthracene	53-70-3	SVOCs					μg/L		0.1	0.1	0	1	0.0038	0
Dibenzofuran	132-64-9	SVOCs					μg/L		5	5	0	1	3.7	0
Diethylphthalate	84-66-2	SVOCs					μg/L		5	5	0	1	110	0
Dimethylphthalate	131-11-3	SVOCs					μg/L		5	5	0	1	270000	0
Di-n-butylphthalate	84-74-2	SVOCs					μg/L		5	5	0	1	10	0
Di-n-octylphthalate	117-84-0	SVOCs					μg/L		5	5	0	1	22	0
Fluoranthene	206-44-0	SVOCs					μg/L		0.1	0.1	0	1	1.9	0
Fluorene	86-73-7	SVOCs					μg/L		0.1	0.1	0	1	19	0
Hexachlorobenzene	118-74-1	SVOCs					μg/L		5	5	0	1	0.00028	0
Hexachlorobutadiene	87-68-3	SVOCs					μg/L		5	5	0	1	0.053	0
Hexachlorocyclopentadiene	77-47-4	SVOCs					μg/L		5	5	0	1	40	0
Hexachloroethane	67-72-1	SVOCs					μg/L		5	5	0	1	1.4	0
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs					μg/L		0.1	0.1	0	1	0.0038	0
Isophorone	78-59-1	SVOCs					μg/L		5	5	0	1	35	0
Naphthalene	91-20-3	SVOCs					μg/L		0.1	0.1	0	1	13	0
Nitrobenzene	98-95-3	SVOCs					μg/L		5	5	0	1	17	0
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					μg/L		5	5	0	1	0.005	0
N-Nitrosodiphenylamine	86-30-6	SVOCs					μg/L		5	5	0	1	3.3	0
Pentachlorophenol	87-86-5	SVOCs					μg/L		0.2	0.2	0	1	0.27	0
Phenanthrene	85-01-8	SVOCs					μg/L		0.1	0.1	0	1	NS	0
Phenol	108-95-2	SVOCs					μg/L		5	5	0	1	180	0
Pyrene	129-00-0	SVOCs					μg/L		0.1	0.1	0	1	0.3	0
Aroclor 1016	12674-11-2	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1221	11104-28-2	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1232	11141-16-5	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1242	53469-21-9	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1248	12672-29-6	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1254	11097-69-1	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1260	11096-82-5	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1262	37324-23-5	PCBs					μg/L		1	1	0	1	0.00006	0
Aroclor 1268	11100-14-4	PCBs					μg/L		1	1	0	1	0.00006	0
4,4'-DDD	72-54-8	Pesticides					μg/L		0.1	0.1	0	1	0.00031	0
4,4'-DDE	72-55-9	Pesticides					μg/L		0.1	0.1	0	1	0.0000000045	0
4,4'-DDT	50-29-3	Pesticides					μg/L		0.1	0.1	0	1	0.00022	0
Aldrin	309-00-2	Pesticides					μg/L		0.05	0.05	0	1	0.000049	0
alpha-BHC	319-84-6	Pesticides					μg/L		0.05	0.05	0	1	0.0026	0
alpha-Chlordane	5103-71-9	Pesticides					μg/L		0.05	0.05	0	1	0.0001	0
beta-BHC	319-85-7	Pesticides					μg/L		0.05	0.05	0	1	0.0091	0
delta-BHC	319-86-8	Pesticides					μg/L		0.05	0.05	0	1	141	0
Dieldrin	60-57-1	Pesticides					μg/L		0.1	0.1	0	1	0.000052	0
Endosulfan I	959-98-8	Pesticides					μg/L		0.05	0.05	0	1	0.056	0
Endosulfan II	33213-65-9	Pesticides					μg/L		0.1	0.1	0	1	0.056	0
Endosulfan Sulfate	1031-07-8	Pesticides					μg/L		0.1	0.1	0	1	2.22	0
Endrin	72-20-8	Pesticides					μg/L		0.1	0.1	0	1	0.036	0
Endrin aldehyde	7421-93-4	Pesticides					μg/L		0.1	0.1	0	1	0.059	0

Table 4-8a
Seep Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Endrin Ketone	53494-70-5	Pesticides					µg/L		0.1	0.1	0	1	NS	0
gamma-BHC (Lindane)	58-89-9	Pesticides					µg/L		0.05	0.05	0	1	0.026	0
gamma-Chlordane	5103-74-2	Pesticides					µg/L		0.05	0.05	0	1	0.0008	0
Heptachlor	76-44-8	Pesticides					µg/L		0.05	0.05	0	1	0.00008	0
Heptachlor Epoxide	1024-57-3	Pesticides					µg/L		0.05	0.05	0	1	0.00004	0
Methoxychlor	72-43-5	Pesticides					µg/L		0.5	0.5	0	1	0.03	0
Toxaphene	8001-35-2	Pesticides					µg/L		5	5	0	1	0.0002	0
Manganese	7439-96-5	Metals	108		151		µg/L	SEEP01	1	1	2	2	50	2
Aluminum	7429-90-5	Metals	39.7	J	39.7	J	µg/L	SEEP01	20	20	1	2	87	0
Antimony	7440-36-0	Metals					µg/L		2	2	0	2	5.6	0
Arsenic	7440-38-2	Metals					µg/L		1	1	0	2	0.017	0
Barium	7440-39-3	Metals	37.1		38		µg/L	SEEP01	10	10	2	2	220	0
Beryllium	7440-41-7	Metals					µg/L		1	1	0	2	3.6	0
Cadmium	7440-43-9	Metals					µg/L		1	1	0	2	0.2	0
Calcium	7440-70-2	Metals	25400		25500		µg/L	SEEP01	500	500	2	2	116000	0
Chromium	7440-47-3	Metals					µg/L		2	2	0	2	NS	0
Cobalt	7440-48-4	Metals					µg/L		1	1	0	2	24	0
Copper	7440-50-8	Metals					µg/L		2	2	0	2	11	0
Hardness	HARDNESS	Metals	94.23		94.23		µg/L	SEEP01			1	1	129	0
Iron	7439-89-6	Metals	151	J	233		µg/L	SEEP01	200	200	2	2	1000	0
Lead	7439-92-1	Metals					µg/L		1	1	0	2	5	0
Magnesium	7439-95-4	Metals	7050		7420		µg/L	SEEP01	500	500	2	2	82000	0
Mercury	7439-97-6	Metals					µg/L		0.2	0.2	0	2	0.05	0
Nickel	7440-02-0	Metals					µg/L		1	1	0	2	54.74	0
Potassium	7440-09-7	Metals	946		966		µg/L	SEEP01	500	500	2	2	53000	0
Selenium	7782-49-2	Metals					µg/L		5	5	0	2	5	0
Silver	7440-22-4	Metals					µg/L		1	1	0	2	4.98	0
Sodium	7440-23-5	Metals	19400		20200		µg/L	SEEP01	500	500	2	2	680000	0
Thallium	7440-28-0	Metals					µg/L		1	1	0	2	0.24	0
Vanadium	7440-62-2	Metals					µg/L		5	5	0	2	12	0
Zinc	7440-66-6	Metals	5.8	J	7.1		µg/L	SEEP01	2	2	2	2	141	0

Notes:
1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:

J - estimated value
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier

Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compound
µg/L - micrograms per liter

Table 4-8b
Round 2 Seep Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Trichloroethene	79-01-6	VOCs	5.9		19		µg/L	SP-02	0.4	2.5	2	7	1	2
1,1,1-Trichloroethane	71-55-6	VOCs	0.19	J	1.4		µg/L	SP-02	0.5	0.5	2	7	76	0
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	0.5	0	7	0.17	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	7	NS	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	7	1	0
1,1-Dichloroethane	75-34-3	VOCs	0.11	J	0.15	J	µg/L	SP-02	0.5	0.5	2	7	47	0
1,1-Dichloroethene	75-35-4	VOCs					µg/L		0.5	0.5	0	7	5	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	7	8	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	7	21	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	7	NS	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	7	NS	0
1,2-Dichlorobenzene	95-50-1	VOCs					µg/L		0.5	0.5	0	7	14	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	7	0.29	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	7	0.5	0
1,3-Dichlorobenzene	541-73-1	VOCs					µg/L		0.5	0.5	0	7	38	0
1,4-Dichlorobenzene	106-46-7	VOCs					µg/L		0.5	0.5	0	7	9	0
2-Butanone	78-93-3	VOCs					µg/L		5	5	0	7	14000	0
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	7	99	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	7	170	0
Acetone	67-64-1	VOCs					µg/L		5	5	0	7	1500	0
Benzene	71-43-2	VOCs					µg/L		0.2	0.2	0	7	0.15	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	7	NS	0
Bromodichloromethane	75-27-4	VOCs					µg/L		0.5	0.5	0	7	0.55	0
Bromoform	75-25-2	VOCs					µg/L		0.5	0.5	0	7	4.3	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	7	16	0
Carbon Disulfide	75-15-0	VOCs					µg/L		0.5	0.5	0	7	0.92	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	7	0.23	0
Chlorobenzene	108-90-7	VOCs					µg/L		0.5	0.5	0	7	47	0
Chloroethane	75-00-3	VOCs					µg/L		0.5	0.5	0	7	NS	0
Chloroform	67-66-3	VOCs	1		1		µg/L	SP-03	0.5	0.5	1	7	6	0
Chloromethane	74-87-3	VOCs					µg/L		0.5	0.5	0	7	NS	0
cis-1,2-Dichloroethene	156-59-2	VOCs	1.8		7.5		µg/L	SP-02	0.5	0.5	2	7	NS	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	7	0.06	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	7	NS	0
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	0.5	0	7	0.4	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	7	NS	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	7	14	0
Isopropylbenzene	98-82-8	VOCs					µg/L		0.5	0.5	0	7	3	0
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	7	27	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	7	NS	0

Table 4-8b
Round 2 Seep Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/L		0.5	0.5	0	7	70	0
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	0.5	0	7	NS	0
Methylene Chloride	75-09-2	VOCs					µg/L		0.5	0.5	0	7	3	0
o-Xylene	95-47-6	VOCs					µg/L		0.5	0.5	0	7	27	0
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	7	32	0
Tetrachloroethene	127-18-4	VOCs					µg/L		0.4	0.4	0	7	0.34	0
Toluene	108-88-3	VOCs					µg/L		0.5	0.5	0	7	253	0
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/L		0.5	0.5	0	7	140	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	7	0.06	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	7	NS	0
Vinyl Chloride	75-01-4	VOCs					µg/L		0.05	0.05	0	7	0.025	0

Notes:
1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:
J - estimated value
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier
Q - data qualifier
VOCs - volatile organic compounds
µg/L - micrograms per liter

Table 4-9a
Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Surface Water Background BTV[3]		
Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
1,1,1-Trichloroethane	71-55-6	VOCs					µg/L		0.5	0.5	0	10	76	0			
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	0.5	0	10	0.17	0			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	10	NS	0			
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	10	1	0			
1,1-Dichloroethane	75-34-3	VOCs					µg/L		0.5	0.5	0	10	47	0			
1,1-Dichloroethene	75-35-4	VOCs					µg/L		0.5	0.5	0	10	5	0			
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	10	8	0			
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	10	21	0			
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	10	NS	0			
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	10	NS	0			
1,2-Dichlorobenzene	95-50-1	VOCs					µg/L		0.5	0.5	0	10	14	0			
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	10	0.29	0			
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	10	0.5	0			
1,3-Dichlorobenzene	541-73-1	VOCs					µg/L		0.5	0.5	0	10	38	0			
1,4-Dichlorobenzene	106-46-7	VOCs					µg/L		0.5	0.5	0	10	9	0			
2-Butanone	78-93-3	VOCs					µg/L		5	5	0	10	14000	0			
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	10	99	0			
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	10	170	0			
Acetone	67-64-1	VOCs					µg/L		5	5	0	10	1500	0			
Benzene	71-43-2	VOCs					µg/L		0.5	0.5	0	10	0.15	0			
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Bromodichloromethane	75-27-4	VOCs					µg/L		0.5	0.5	0	10	0.55	0			
Bromoform	75-25-2	VOCs					µg/L		0.5	0.5	0	10	4.3	0			
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	10	16	0			
Carbon Disulfide	75-15-0	VOCs					µg/L		0.5	0.5	0	10	0.92	0			
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	10	0.23	0			
Chlorobenzene	108-90-7	VOCs					µg/L		0.5	0.5	0	10	47	0			
Chloroethane	75-00-3	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Chloroform	67-66-3	VOCs					µg/L		0.5	0.5	0	10	6	0			
Chloromethane	74-87-3	VOCs					µg/L		0.5	0.5	0	10	NS	0			
cis-1,2-Dichloroethene	156-59-2	VOCs	0.3	J	0.3	J	µg/L	SW/SED09	0.5	0.5	1	10	NS	0			
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	10	0.06	0			
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	0.5	0	10	0.4	0			
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	10	14	0			
Isopropylbenzene	98-82-8	VOCs					µg/L		0.5	0.5	0	10	3	0			
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/L		0.5	0.5	0	10	70	0			
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Methylene Chloride	75-09-2	VOCs					µg/L		0.5	0.5	0	10	3	0			
o-Xylene	95-47-6	VOCs					µg/L		0.5	0.5	0	10	27	0			
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	10	32	0			
Tetrachloroethene	127-18-4	VOCs					µg/L		0.5	0.5	0	10	0.34	0			
Toluene	108-88-3	VOCs					µg/L		0.5	0.5	0	10	253	0			
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/L		0.5	0.5	0	10	140	0			
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	10	0.06	0			
Trichloroethene	79-01-6	VOCs	0.1	J	0.15	J	µg/L	SW/SED03	0.5	0.5	2	10	1	0			
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	10	NS	0			
Vinyl Chloride	75-01-4	VOCs					µg/L		0.5	0.5	0	10	0.025	0			
1,1'-Biphenyl	92-52-4	SVOCs					µg/L		5	5	0	10	14	0			
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/L		5	5	0	10	0.97	0			
1,4-Dioxane	123-91-1	SVOCs	0.21	J	0.21	J	µg/L	SW/SED10	0.5	0.5	1	1	22000	0			
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/L		5	5	0	10	1400	0			

Table 4-9a
Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Surface Water Background BTV[3]		
Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/L		5	5	0	10	1	0			
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/L		5	5	0	10	1800	0			
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/L		5	5	0	10	1	0			
2,4-Dichlorophenol	120-83-2	SVOCs					µg/L		5	5	0	10	11	0			
2,4-Dimethylphenol	105-67-9	SVOCs					µg/L		5	5	0	10	100	0			
2,4-Dinitrophenol	51-28-5	SVOCs					µg/L		10	10	0	10	19.00	0			
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/L		5	5	0	10	0.11	0			
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/L		5	5	0	10	81	0			
2-Chloronaphthalene	91-58-7	SVOCs					µg/L		5	5	0	10	0.396	0			
2-Chlorophenol	95-57-8	SVOCs					µg/L		5	5	0	10	24	0			
2-Methylnaphthalene	91-57-6	SVOCs					µg/L		0.1	0.1	0	10	330	0			
2-Methylphenol	95-48-7	SVOCs					µg/L		5	5	0	10	13	0			
2-Nitroaniline	88-74-4	SVOCs					µg/L		10	10	0	10	NS	0			
2-Nitrophenol	88-75-5	SVOCs					µg/L		5	5	0	10	1920	0			
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/L		5	5	0	10	0.021	0			
3-Nitroaniline	99-09-2	SVOCs					µg/L		10	10	0	10	NS	0			
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs					µg/L		10	10	0	10	13	0			
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/L		5	5	0	10	1.5	0			
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/L		5	5	0	10	NS	0			
4-Chloroaniline	106-47-8	SVOCs					µg/L		5	5	0	10	232	0			
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/L		5	5	0	10	NS	0			
4-Methylphenol	106-44-5	SVOCs					µg/L		5	5	0	10	543	0			
4-Nitroaniline	100-01-6	SVOCs					µg/L		10	10	0	10	NS	0			
4-Nitrophenol	100-02-7	SVOCs					µg/L		10	10	0	10	60	0			
Acenaphthene	83-32-9	SVOCs					µg/L		0.1	0.1	0	10	38	0			
Acenaphthylene	208-96-8	SVOCs					µg/L		0.1	0.1	0	10	4840	0			
Acetophenone	98-86-2	SVOCs					µg/L		5	5	0	10	NS	0			
Anthracene	120-12-7	SVOCs					µg/L		0.1	0.1	0	10	0.035	0			
Atrazine	1912-24-9	SVOCs					µg/L		5	5	0	10	1.8	0			
Benzaldehyde	100-52-7	SVOCs					µg/L		5	5	0	10	NS	0			
Benzo(a)anthracene	56-55-3	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Benzo(a)pyrene	50-32-8	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Benzo(b)fluoranthene	205-99-2	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Benzo(g,h,i)perylene	191-24-2	SVOCs	0.083	J	0.18	J	µg/L	SW/SED07	5	0.1	7	10	7.64	0			
Benzo(k)fluoranthene	207-08-9	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/L		5	5	0	10	NS	0			
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/L		5	5	0	10	0.03	0			
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs					µg/L		5	5	0	10	0.30	0			
Butylbenzylphthalate	85-68-7	SVOCs					µg/L		5	5	0	10	23.00000	0			
Caprolactam	105-60-2	SVOCs					µg/L		5	5	0	10	NS	0			
Carbazole	86-74-8	SVOCs					µg/L		5	5	0	10	NS	0			
Chrysene	218-01-9	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Dibenzo(a,h)anthracene	53-70-3	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			
Dibenzofuran	132-64-9	SVOCs					µg/L		5	5	0	10	3.7	0			
Diethylphthalate	84-66-2	SVOCs					µg/L		5	5	0	10	110	0			
Dimethylphthalate	131-11-3	SVOCs					µg/L		5	5	0	10	270000	0			
Di-n-butylphthalate	84-74-2	SVOCs					µg/L		5	5	0	10	9.7	0			
Di-n-octylphthalate	117-84-0	SVOCs					µg/L		5	5	0	10	22	0			
Fluoranthene	206-44-0	SVOCs					µg/L		0.1	0.1	0	10	1.9	0			
Fluorene	86-73-7	SVOCs					µg/L		0.1	0.1	0	10	19	0			
Hexachlorobenzene	118-74-1	SVOCs					µg/L		5	5	0	10	0.00028	0			
Hexachlorobutadiene	87-68-3	SVOCs					µg/L		5	5	0	10	0.053	0			
Hexachlorocyclopentadiene	77-47-4	SVOCs					µg/L		5	5	0	10	40	0			
Hexachloroethane	67-72-1	SVOCs					µg/L		5	5	0	10	1.4	0			
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs					µg/L		0.1	0.1	0	10	0.0038	0			

Table 4-9a
Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Surface Water Background BTV[3] Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
Isophorone	78-59-1	SVOCs					µg/L		5	5	0	10	35	0			
Naphthalene	91-20-3	SVOCs					µg/L		0.1	0.1	0	10	13	0			
Nitrobenzene	98-95-3	SVOCs					µg/L		5	5	0	10	17	0			
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					µg/L		5	5	0	10	0.0	0			
N-Nitrosodiphenylamine	86-30-6	SVOCs					µg/L		5	5	0	10	3.30	0			
Pentachlorophenol	87-86-5	SVOCs					µg/L		0.2	0.2	0	10	0.270	0			
Phenanthrene	85-01-8	SVOCs					µg/L		0.1	0.1	0	10	0	0			
Phenol	108-95-2	SVOCs					µg/L		5	5	0	10	180	0			
Pyrene	129-00-0	SVOCs					µg/L		0.1	0.1	0	10	0.3	0			
Aroclor 1016	12674-11-2	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1221	11104-28-2	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1232	11141-16-5	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1242	53469-21-9	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1248	12672-29-6	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1254	11097-69-1	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1260	11096-82-5	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1262	37324-23-5	PCBs					µg/L		1	1	0	10	0.000064	0			
Aroclor 1268	11100-14-4	PCBs					µg/L		1	1	0	10	0.000064	0			
4,4'-DDD	72-54-8	Pesticides					µg/L		0.1	0.1	0	10	0.00031	0			
4,4'-DDE	72-55-9	Pesticides					µg/L		0.1	0.1	0	10	0.0000000045	0			
4,4'-DDT	50-29-3	Pesticides					µg/L		0.1	0.1	0	10	0.00022	0			
Aldrin	309-00-2	Pesticides					µg/L		0.05	0.05	0	10	0.000049	0			
alpha-BHC	319-84-6	Pesticides					µg/L		0.05	0.05	0	10	0.0026	0			
alpha-Chlordane	5103-71-9	Pesticides					µg/L		0.05	0.05	0	10	0.0001	0			
beta-BHC	319-85-7	Pesticides					µg/L		0.05	0.05	0	10	0.0091	0			
delta-BHC	319-86-8	Pesticides					µg/L		0.05	0.05	0	10	141	0			
Dieldrin	60-57-1	Pesticides					µg/L		0.1	0.1	0	10	0.000052	0			
Endosulfan I	959-98-8	Pesticides					µg/L		0.05	0.05	0	10	0.056	0			
Endosulfan II	33213-65-9	Pesticides					µg/L		0.1	0.1	0	10	0.056	0			
Endosulfan Sulfate	1031-07-8	Pesticides					µg/L		0.1	0.1	0	10	2.22	0			
Endrin	72-20-8	Pesticides					µg/L		0.1	0.1	0	10	0.036	0			
Endrin aldehyde	7421-93-4	Pesticides					µg/L		0.1	0.1	0	10	0.059	0			
Endrin Ketone	53494-70-5	Pesticides					µg/L		0.1	0.1	0	10	NS	0			
gamma-BHC (Lindane)	58-89-9	Pesticides					µg/L		0.05	0.05	0	10	0.026	0			
gamma-Chlordane	5103-74-2	Pesticides					µg/L		0.05	0.05	0	10	0.0008	0			
Heptachlor	76-44-8	Pesticides					µg/L		0.05	0.05	0	10	0.000079	0			
Heptachlor Epoxide	1024-57-3	Pesticides					µg/L		0.05	0.05	0	10	0.000039	0			
Methoxychlor	72-43-5	Pesticides					µg/L		0.5	0.5	0	10	0.03	0			
Toxaphene	8001-35-2	Pesticides					µg/L		5	5	0	10	0.0002	0			
Arsenic	7440-38-2	Metals	0.26	J	1.6		µg/L	SW/SED03	1	1	8	21	0.017	10	0.26	2.7	3.615
Manganese	7439-96-5	Metals	2		90.5		µg/L	SW/SED02	1	1	21	21	50	5	6	2460	8436
Aluminum	7429-90-5	Metals	27.1		305	J	µg/L	SW/SED07	20	20	8	21	87	4	24.4	727	1564
Chromium	7440-47-3	Metals	0.4	J	127		µg/L	SW/SED07	2	2	10	21	10	2	2.5	2.7	2.7
Antimony	7440-36-0	Metals	5.6		5.6		µg/L	SW/SED10	2	2	1	21	5.6	1			
Cadmium	7440-43-9	Metals	0.16	J	0.86	J	µg/L	SW/SED05	1	1	2	21	0.2	1			
Iron	7439-89-6	Metals	74.5	J	1020		µg/L	SW/SED07	200	200	17	21	1000	1	313	2720	6921
Lead	7439-92-1	Metals	1.6		6.1		µg/L	SW/SED05	1	1	3	21	5	1	1.1	4.4	5.95
Barium	7440-39-3	Metals	15.5		60.4		µg/L	SW/SED09	10	10	21	21	220	0			
Beryllium	7440-41-7	Metals					µg/L		1	1	0	21	3.6	0			
Calcium	7440-70-2	Metals	4950		46500		µg/L	SW/SED09	500	500	21	21	116000	0			
Cobalt	7440-48-4	Metals	0.41	J	0.41	J	µg/L	SW/SED10	1	1	1	21	24	0			
Copper	7440-50-8	Metals	2.1		5		µg/L	SW/SED10	2	2	14	21	11	0			
Hardness	HARDNESS	Metals	16.52		163.2		µg/L	SW/SED09			11	11	NS	0			
Magnesium	7439-95-4	Metals	1010		12100		µg/L	03SW/SED07SW/	500	500	21	21	82000	0			
Mercury	7439-97-6	Metals	0.012	J	0.028	J	µg/L	SW/SED07	0.2	0.2	2	21	0.05	0			

Table 4-9a
Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Surface Water Background BTV[3] Minimum Result	Maximum Result	Background Threshold Value (85% UTL)
Nickel	7440-02-0	Metals	0.63	J	42.1		µg/L	SW/SED07	1	1	18	21	55	0			
Potassium	7440-09-7	Metals	926	J	2000		µg/L	SW/SED07	500	500	20	21	53000	0			
Selenium	7782-49-2	Metals					µg/L		5	5	0	21	5	0			
Silver	7440-22-4	Metals					µg/L		1	1	0	21	4.98	0			
Sodium	7440-23-5	Metals	2160		45200		µg/L	SW/SED08	500	500	21	21	680000	0			
Thallium	7440-28-0	Metals					µg/L		1	1	0	21	0.24	0			
Vanadium	7440-62-2	Metals	0.22	J	0.77	J	µg/L	SW/SED07	5	5	1	21	12	0			
Zinc	7440-66-6	Metals	3.4		133		µg/L	SW/SED07	2	12	20	21	141	0			

Notes:
1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.
3. Background samples were collected from unimpacted areas and utilized to calculate a background threshhold value (BTV) to compare to RI sampling results .

Acronyms:
J - estimated value
NS - no standard
PCBs - polychlorinated biphenyls
Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
µg/L - micrograms per liter

Table 4-9b
Round 2 Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
1,1,1-Trichloroethane	71-55-6	VOCs					µg/L		0.5	0.5	0	2	76	0
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/L		0.5	0.5	0	2	0.17	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,1,2-Trichloroethane	79-00-5	VOCs					µg/L		0.5	0.5	0	2	1	0
1,1-Dichloroethane	75-34-3	VOCs					µg/L		0.5	0.5	0	2	47	0
1,1-Dichloroethene	75-35-4	VOCs					µg/L		0.5	0.5	0	2	5	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/L		0.5	0.5	0	2	8	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/L		0.5	0.5	0	2	21	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,2-Dibromoethane	106-93-4	VOCs					µg/L		0.5	0.5	0	2	NS	0
1,2-Dichlorobenzene	95-50-1	VOCs					µg/L		0.5	0.5	0	2	14	0
1,2-Dichloroethane	107-06-2	VOCs					µg/L		0.5	0.5	0	2	0.29	0
1,2-Dichloropropane	78-87-5	VOCs					µg/L		0.5	0.5	0	2	0.5	0
1,3-Dichlorobenzene	541-73-1	VOCs					µg/L		0.5	0.5	0	2	38	0
1,4-Dichlorobenzene	106-46-7	VOCs					µg/L		0.5	0.5	0	2	9	0
2-Butanone	78-93-3	VOCs					µg/L		5	5	0	2	14000	0
2-Hexanone	591-78-6	VOCs					µg/L		5	5	0	2	99	0
4-Methyl-2-pentanone	108-10-1	VOCs					µg/L		5	5	0	2	170	0
Acetone	67-64-1	VOCs					µg/L		5	5	0	2	1500	0
Benzene	71-43-2	VOCs					µg/L		0.2	0.2	0	2	0.15	0
Bromochloromethane	74-97-5	VOCs					µg/L		0.5	0.5	0	2	NS	0
Bromodichloromethane	75-27-4	VOCs					µg/L		0.5	0.5	0	2	0.55	0
Bromoform	75-25-2	VOCs					µg/L		0.5	0.5	0	2	4.3	0
Bromomethane	74-83-9	VOCs					µg/L		0.5	0.5	0	2	16	0
Carbon Disulfide	75-15-0	VOCs					µg/L		0.5	0.5	0	2	0.92	0
Carbon Tetrachloride	56-23-5	VOCs					µg/L		0.5	0.5	0	2	0.23	0
Chlorobenzene	108-90-7	VOCs					µg/L		0.5	0.5	0	2	47	0
Chloroethane	75-00-3	VOCs					µg/L		0.5	0.5	0	2	NS	0
Chloroform	67-66-3	VOCs					µg/L		0.5	0.5	0	2	6	0
Chloromethane	74-87-3	VOCs					µg/L		0.5	0.5	0	2	NS	0
cis-1,2-Dichloroethene	156-59-2	VOCs					µg/L		0.5	0.5	0	2	NS	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/L		0.5	0.5	0	2	0.06	0
Cyclohexane	110-82-7	VOCs					µg/L		0.5	0.5	0	2	NS	0
Dibromochloromethane	124-48-1	VOCs					µg/L		0.5	0.5	0	2	0.4	0
Dichlorodifluoromethane	75-71-8	VOCs					µg/L		0.5	0.5	0	2	NS	0
Ethylbenzene	100-41-4	VOCs					µg/L		0.5	0.5	0	2	14	0
Isopropylbenzene	98-82-8	VOCs					µg/L		0.5	0.5	0	2	3	0
m,p-Xylene	179601-23-1	VOCs					µg/L		0.5	0.5	0	2	27	0
Methyl acetate	79-20-9	VOCs					µg/L		0.5	0.5	0	2	NS	0
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/L		0.5	0.5	0	2	70	0

Table 4-9b
Round 2 Surface Water Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
Methylcyclohexane	108-87-2	VOCs					µg/L		0.5	0.5	0	2	NS	0
Methylene Chloride	75-09-2	VOCs					µg/L		0.5	0.5	0	2	3	0
o-Xylene	95-47-6	VOCs					µg/L		0.5	0.5	0	2	27	0
Styrene	100-42-5	VOCs					µg/L		0.5	0.5	0	2	32	0
Tetrachloroethene	127-18-4	VOCs					µg/L		0.4	0.4	0	2	0.34	0
Toluene	108-88-3	VOCs					µg/L		0.5	0.5	0	2	253	0
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/L		0.5	0.5	0	2	140	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	2	0.06	0
Trichloroethene	79-01-6	VOCs					µg/L		0.4	0.4	0	2	1	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	2	NS	0
Vinyl Chloride	75-01-4	VOCs					µg/L		0.05	0.05	0	2	0.025	0
1,4-Dioxane	123-91-1	SVOCs	0.12	J	0.12	J	µg/L	PZ-1	0.18	0.2	1	2	22000	0

Notes:
1. RI screening criteria are summarized on Table 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:

J - estimated value
NS - no standard
Q - data qualifier
SVOCs - semi-volatile organic compounds
VOCs - volatile organic compounds
ug/L - micrograms per liter

Table 4-9c
Catch Basin Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
1,1,1-Trichloroethane	71-55-6	VOCs					μg/L		0.5	0.5	0	2	76	0
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					μg/L		0.5	0.5	0	2	0.17	0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					μg/L		0.5	0.5	0	2	NS	0
1,1,2-Trichloroethane	79-00-5	VOCs					μg/L		0.5	0.5	0	2	1	0
1,1-Dichloroethane	75-34-3	VOCs					μg/L		0.5	0.5	0	2	47	0
1,1-Dichloroethene	75-35-4	VOCs					μg/L		0.5	0.5	0	2	5	0
1,2,3-Trichlorobenzene	87-61-6	VOCs					μg/L		0.5	0.5	0	2	8	0
1,2,4-Trichlorobenzene	120-82-1	VOCs					μg/L		0.5	0.5	0	2	21	0
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					μg/L		0.5	0.5	0	2	NS	0
1,2-Dibromoethane	106-93-4	VOCs					μg/L		0.5	0.5	0	2	NS	0
1,2-Dichlorobenzene	95-50-1	VOCs					μg/L		0.5	0.5	0	2	14	0
1,2-Dichloroethane	107-06-2	VOCs					μg/L		0.5	0.5	0	2	0.29	0
1,2-Dichloropropane	78-87-5	VOCs					μg/L		0.5	0.5	0	2	0.5	0
1,3-Dichlorobenzene	541-73-1	VOCs					μg/L		0.5	0.5	0	2	38	0
1,4-Dichlorobenzene	106-46-7	VOCs					μg/L		0.5	0.5	0	2	9	0
2-Butanone	78-93-3	VOCs					μg/L		5	5	0	2	14000	0
2-Hexanone	591-78-6	VOCs					μg/L		5	5	0	2	99	0
4-Methyl-2-pentanone	108-10-1	VOCs					μg/L		5	5	0	2	170	0
Acetone	67-64-1	VOCs					μg/L		5	5	0	2	1500	0
Benzene	71-43-2	VOCs					μg/L		0.2	0.2	0	2	0.15	0
Bromochloromethane	74-97-5	VOCs					μg/L		0.5	0.5	0	2	NS	0
Bromodichloromethane	75-27-4	VOCs					μg/L		0.5	0.5	0	2	0.55	0
Bromoform	75-25-2	VOCs					μg/L		0.5	0.5	0	2	4.3	0
Bromomethane	74-83-9	VOCs					μg/L		0.5	0.5	0	2	16	0
Carbon Disulfide	75-15-0	VOCs					μg/L		0.5	0.5	0	2	0.92	0
Carbon Tetrachloride	56-23-5	VOCs					μg/L		0.5	0.5	0	2	0.23	0
Chlorobenzene	108-90-7	VOCs					μg/L		0.5	0.5	0	2	47	0
Chloroethane	75-00-3	VOCs					μg/L		0.5	0.5	0	2	NS	0
Chloroform	67-66-3	VOCs					μg/L		0.5	0.5	0	2	6	0
Chloromethane	74-87-3	VOCs					μg/L		0.5	0.5	0	2	NS	0
cis-1,2-Dichloroethene	156-59-2	VOCs					μg/L		0.5	0.5	0	2	NS	0
cis-1,3-Dichloropropene	10061-01-5	VOCs					μg/L		0.5	0.5	0	2	0.06	0
Cyclohexane	110-82-7	VOCs					μg/L		0.5	0.5	0	2	NS	0
Dibromochloromethane	124-48-1	VOCs					μg/L		0.5	0.5	0	2	0.4	0
Dichlorodifluoromethane	75-71-8	VOCs					μg/L		0.5	0.5	0	2	NS	0
Ethylbenzene	100-41-4	VOCs					μg/L		0.5	0.5	0	2	14	0
Isopropylbenzene	98-82-8	VOCs					μg/L		0.5	0.5	0	2	3	0
m,p-Xylene	179601-23-1	VOCs					μg/L		0.5	0.5	0	2	27	0
Methyl acetate	79-20-9	VOCs					μg/L		0.5	0.5	0	2	NS	0
Methyl tert-Butyl Ether	1634-04-4	VOCs					μg/L		0.5	0.5	0	2	70	0
Methylcyclohexane	108-87-2	VOCs					μg/L		0.5	0.5	0	2	NS	0
Methylene Chloride	75-09-2	VOCs					μg/L		0.5	0.5	0	2	3	0
o-Xylene	95-47-6	VOCs					μg/L		0.5	0.5	0	2	27	0
Styrene	100-42-5	VOCs					μg/L		0.5	0.5	0	2	32	0
Tetrachloroethene	127-18-4	VOCs					μg/L		0.4	0.4	0	2	0.34	0
Toluene	108-88-3	VOCs					μg/L		0.5	0.5	0	2	253	0

Table 4-9c
Catch Basin Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/L		0.5	0.5	0	2	140	0
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/L		0.5	0.5	0	2	0.06	0
Trichloroethene	79-01-6	VOCs	0.44		0.44		µg/L	CB-02	0.4	0.4	1	2	1	0
Trichlorofluoromethane	75-69-4	VOCs					µg/L		0.5	0.5	0	2	NS	0
Vinyl Chloride	75-01-4	VOCs					µg/L		0.05	0.05	0	2	0.025	0

Notes:
1. RI screening criteria are summarized on Tables 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.

Acronyms:
J - estimated value
NS - no standard
Q - data qualifier
VOCs - volatile organic compounds
µg/L - micrograms per liter

Table 4-10
Sediment Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Sediments[3] Minimum Result	Background Sediments[3] Maximum Result	Background Sediments[3] Background Threshold Value (95% UTL)
1,1,1-Trichloroethane	71-55-6	VOCs					µg/kg		4.6	12	0	17	213	0			
1,1,2,2-Tetrachloroethane	79-34-5	VOCs					µg/kg		4.6	12	0	17	850	0			
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	VOCs					µg/kg		4.6	12	0	17	6,700,000	0			
1,1,2-Trichloroethane	79-00-5	VOCs					µg/kg		4.6	12	0	17	518	0			
1,1-Dichloroethane	75-34-3	VOCs					µg/kg		4.6	12	0	17	3,600	0			
1,1-Dichloroethene	75-35-4	VOCs					µg/kg		4.6	12	0	17	19	0			
1,2,3-Trichlorobenzene	87-61-6	VOCs					µg/kg		4.6	12	0	17	858	0			
1,2,4-Trichlorobenzene	120-82-1	VOCs					µg/kg		4.6	12	0	17	5,062	0			
1,2-Dibromo-3-chloropropane	96-12-8	VOCs					µg/kg		4.6	12	0	17	5	0			
1,2-Dibromoethane	106-93-4	VOCs					µg/kg		4.6	12	0	17	36	0			
1,2-Dichlorobenzene	95-50-1	VOCs					µg/kg		4.6	12	0	17	294	0			
1,2-Dichloroethane	107-06-2	VOCs					µg/kg		4.6	12	0	17	260	0			
1,2-Dichloropropane	78-87-5	VOCs					µg/kg		4.6	12	0	17	333	0			
1,3-Dichlorobenzene	541-73-1	VOCs					µg/kg		4.6	12	0	17	1,315	0			
1,4-Dichlorobenzene	106-46-7	VOCs					µg/kg		4.6	12	0	17	318	0			
2-Butanone	78-93-3	VOCs					µg/kg		9.3	24	0	17	27,000,000	0			
2-Hexanone	591-78-6	VOCs					µg/kg		9.3	24	0	17	200,000	0			
4-Methyl-2-pentanone	108-10-1	VOCs					µg/kg		9.3	24	0	17	33,000,000	0			
Acetone	67-64-1	VOCs	55		55		µg/kg	PZ-1	9.3	24	1	17	61,000,000	0			
Benzene	71-43-2	VOCs					µg/kg		4.6	12	0	17	142	0			
Bromochloromethane	74-97-5	VOCs					µg/kg		4.6	12	0	17	150,000	0			
Bromodichloromethane	75-27-4	VOCs					µg/kg		4.6	12	0	17	290	0			
Bromoform	75-25-2	VOCs					µg/kg		4.6	12	0	17	492	0			
Bromomethane	74-83-9	VOCs					µg/kg		4.6	12	0	17	1.37	0			
Carbon Disulfide	75-15-0	VOCs					µg/kg		4.6	12	0	17	1	0			
Carbon Tetrachloride	56-23-5	VOCs					µg/kg		4.6	12	0	17	1,450	0			
Chlorobenzene	108-90-7	VOCs					µg/kg		4.6	12	0	17	291	0			
Chloroethane	75-00-3	VOCs					µg/kg		4.6	12	0	17	14,000,000	0			
Chloroform	67-66-3	VOCs					µg/kg		4.6	12	0	17	121	0			
Chloromethane	74-87-3	VOCs					µg/kg		4.6	12	0	17	110,000	0			
cis-1,2-Dichloroethene	156-59-2	VOCs					µg/kg		4.6	12	0	17	160,000	0			
cis-1,3-Dichloropropene	10061-01-5	VOCs					µg/kg		4.6	12	0	17	1,800	0			
Cyclohexane	110-82-7	VOCs					µg/kg		4.6	12	0	17	6,500,000	0			
Dibromochloromethane	124-48-1	VOCs					µg/kg		4.6	12	0	17	8,300	0			
Dichlorodifluoromethane	75-71-8	VOCs					µg/kg		4.6	12	0	17	87,000	0			
Ethylbenzene	100-41-4	VOCs					µg/kg		4.6	12	0	17	175	0			
Isopropylbenzene	98-82-8	VOCs					µg/kg		4.6	12	0	17	86	0			
m,p-Xylene	179601-23-1	VOCs					µg/kg		4.6	12	0	17	NS	0			
Methyl acetate	79-20-9	VOCs					µg/kg		4.6	12	0	17	78,000,000	0			
Methyl tert-Butyl Ether	1634-04-4	VOCs					µg/kg		4.6	12	0	17	47,000	0			
Methylcyclohexane	108-87-2	VOCs					µg/kg		4.6	12	0	17	NS	0			
Methylene Chloride	75-09-2	VOCs					µg/kg		4.6	12	0	17	159	0			
o-Xylene	95-47-6	VOCs					µg/kg		4.6	12	0	17	433	0			
Styrene	100-42-5	VOCs					µg/kg		4.6	12	0	17	254	0			
Tetrachloroethene	127-18-4	VOCs					µg/kg		4.6	12	0	17	450	0			
Toluene	108-88-3	VOCs					µg/kg		4.6	12	0	17	1,220	0			
trans-1,2-Dichloroethene	156-60-5	VOCs					µg/kg		4.6	12	0	17	654	0			
trans-1,3-Dichloropropene	10061-02-6	VOCs					µg/kg		4.6	12	0	17	1,800	0			
Trichloroethene	79-01-6	VOCs					µg/kg		4.6	12	0	17	112	0			
Trichlorofluoromethane	75-69-4	VOCs					µg/kg		4.6	12	0	17	23,000,000	0			
Vinyl Chloride	75-01-4	VOCs					µg/kg		4.6	12	0	17	202	0			
Acenaphthylene	208-96-8	SVOCs	4.4	J	14000		µg/kg	SW/SED11	3.4	270	9	12	5.87	9	14	8000	**9946**
Benzo(a)anthracene	56-55-3	SVOCs	18		43000		µg/kg	SW/SED11	3.4	270	10	12	108	9	8.9	19000	**24296**
Benzo(a)pyrene	50-32-8	SVOCs	45		35000		µg/kg	SW/SED11	3.4	400	10	12	150	7	17	16000	**20185**
Chrysene	218-01-9	SVOCs	27		43000		µg/kg	SW/SED11	3.4	270	10	12	166	7	11	18000	**23107**
Fluoranthene	206-44-0	SVOCs	4.6		120000		µg/kg	SW/SED11	4.2	270	11	12	423	7	13	53000	**64517**
Pyrene	129-00-0	SVOCs	8.3		61000		µg/kg	SW/SED11	3.9	270	11	12	195	7	15	29000	**41398**
Dibenzo(a,h)anthracene	53-70-3	SVOCs	13		7200		µg/kg	SW/SED11	3.4	270	10	12	33	6	4.9	3500	**4394**
Acenaphthene	83-32-9	SVOCs	5.4		970		µg/kg	SW/SED11	3.4	270	7	12	6.71	6	22	320	**198.5**
Anthracene	120-12-7	SVOCs	3.1	J	11000		µg/kg	SW/SED11	3.4	270	10	12	57	5	13	6100	**7039**
Benzo(g,h,i)perylene	191-24-2	SVOCs	7.6		17000		µg/kg	SW/SED11	3.4	400	12	12	170	5	7.2	6700	**9676**
Benzo(k)fluoranthene	207-08-9	SVOCs	38	J	37000		µg/kg	SW/SED11	3.4	400	10	12	240	5	13	13000	**17097**
Indeno(1,2,3-cd)pyrene	193-39-5	SVOCs	6.9		19000		µg/kg	SW/SED11	3.4	400	11	12	200	5	3	7600	**11757**
Phenanthrene	85-01-8	SVOCs	4.5		17000		µg/kg	SW/SED11	3.4	270	11	12	204	5	12	14000	**18138**
2-Methylnaphthalene	91-57-6	SVOCs	8.6		810		µg/kg	SW/SED11	3.4	270	7	12	20	4	18	560	**559.7**

Table 4-10
Sediment Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

															Background Sediments[3]		
Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Minimum Result	Maximum Result	Background Threshold Value (95% UTL)
Bis(2-ethylhexyl)phthalate	117-81-7	SVOCs	76	J	200	J	µg/kg	SW/SED08	180	400	7	12	182	3	110	850	**1048**
Fluorene	86-73-7	SVOCs	4.6		1300		µg/kg	SW/SED11	3.4	270	9	12	77	2	130	1500	**1471**
Benzo(b)fluoranthene	205-99-2	SVOCs	38		30000		µg/kg	SW/SED11	3.4	400	10	12	10,400	1	14	22000	**25972**
Dibenzofuran	132-64-9	SVOCs	510		510		µg/kg	SW/SED11	180	400	1	12	415	1	570	570	**570**
Naphthalene	91-20-3	SVOCs	7.8		400	J	µg/kg	SW/SED11	3.4	270	7	12	160	1	13	420	**389.5**
1,1'-Biphenyl	92-52-4	SVOCs	120	J	120	J	µg/kg	SW/SED11	180	400	1	12	1,220	0			
1,2,4,5-Tetrachlorobenzene	95-94-3	SVOCs					µg/kg		180	400	0	12	1,252	0			
1,4-Dioxane	123-91-1	SVOCs					µg/kg		100	240	0	12	5,300	0			
2,2'-Oxybis(1-chloropropane)	108-60-1	SVOCs					µg/kg		180	400	0	12	3,100,000	0			
2,3,4,6-Tetrachlorophenol	58-90-2	SVOCs					µg/kg		180	400	0	12	284	0			
2,4,5-Trichlorophenol	95-95-4	SVOCs					µg/kg		180	400	0	12	6,300,000	0			
2,4,6-Trichlorophenol	88-06-2	SVOCs					µg/kg		180	400	0	12	208	0			
2,4-Dichlorophenol	120-83-2	SVOCs					µg/kg		180	400	0	12	82	0			
2,4-Dimethylphenol	105-67-9	SVOCs	210	J	210	J	µg/kg	SW/SED11	180	400	1	12	304	0			
2,4-Dinitrophenol	51-28-5	SVOCs					µg/kg		340	780	0	12	6	0			
2,4-Dinitrotoluene	121-14-2	SVOCs					µg/kg		180	400	0	12	14	0			
2,6-Dinitrotoluene	606-20-2	SVOCs					µg/kg		180	400	0	12	360	0			
2-Chloronaphthalene	91-58-7	SVOCs					µg/kg		180	400	0	12	417	0			
2-Chlorophenol	95-57-8	SVOCs					µg/kg		180	400	0	12	32	0			
2-Methylphenol	95-48-7	SVOCs					µg/kg		180	400	0	12	3,200,000	0			
2-Nitroaniline	88-74-4	SVOCs					µg/kg		340	780	0	12	630,000	0			
2-Nitrophenol	88-75-5	SVOCs					µg/kg		180	400	0	12	NS	0			
3,3'-Dichlorobenzidine	91-94-1	SVOCs					µg/kg		180	400	0	12	127	0			
3-Nitroaniline	99-09-2	SVOCs					µg/kg		340	780	0	12	NS	0			
4,6-Dinitro-2-methylphenol	534-52-1	SVOCs	190	J	190	J	µg/kg	SW/SED11	340	780	1	12	5,100	0			
4-Bromophenyl-phenylether	101-55-3	SVOCs					µg/kg		180	400	0	12	1,230	0			
4-Chloro-3-methylphenol	59-50-7	SVOCs					µg/kg		180	400	0	12	6,300,000	0			
4-Chloroaniline	106-47-8	SVOCs					µg/kg		180	400	0	12	2,700	0			
4-Chlorophenyl-phenylether	7005-72-3	SVOCs					µg/kg		180	400	0	12	NS	0			
4-Methylphenol	106-44-5	SVOCs	82	J	340		µg/kg	SW/SED11	180	400	2	12	670	0			
4-Nitroaniline	100-01-6	SVOCs					µg/kg		340	780	0	12	27,000	0			
4-Nitrophenol	100-02-7	SVOCs					µg/kg		340	780	0	12	13	0			
Acetophenone	98-86-2	SVOCs					µg/kg		180	400	0	12	7,800,000	0			
Atrazine	1912-24-9	SVOCs					µg/kg		180	400	0	12	7	0			
Benzaldehyde	100-52-7	SVOCs					µg/kg		180	400	0	12	170,000	0			
Bis(2-chloroethoxy)methane	111-91-1	SVOCs					µg/kg		180	400	0	12	190,000	0			
Bis(2-chloroethyl)ether	111-44-4	SVOCs					µg/kg		180	400	0	12	3,520	0			
Butylbenzylphthalate	85-68-7	SVOCs	98	J	98	J	µg/kg	SW/SED04	180	400	1	12	1,970	0			
Caprolactam	105-60-2	SVOCs					µg/kg		180	400	0	12	31,000,000	0			
Carbazole	86-74-8	SVOCs	110	J	2200		µg/kg	SW/SED11	180	400	4	12	NS	0			
Diethylphthalate	84-66-2	SVOCs					µg/kg		180	400	0	12	295	0			
Dimethylphthalate	131-11-3	SVOCs					µg/kg		180	400	0	12	NS	0			
Di-n-butylphthalate	84-74-2	SVOCs					µg/kg		180	400	0	12	1,114	0			
Di-n-octylphthalate	117-84-0	SVOCs					µg/kg		180	400	0	12	630,000	0			
Hexachlorobenzene	118-74-1	SVOCs					µg/kg		180	400	0	12	20	0			
Hexachlorobutadiene	87-68-3	SVOCs					µg/kg		180	400	0	12	27	0			
Hexachlorocyclopentadiene	77-47-4	SVOCs					µg/kg		180	400	0	12	901	0			
Hexachloroethane	67-72-1	SVOCs					µg/kg		180	400	0	12	584	0			
Isophorone	78-59-1	SVOCs					µg/kg		180	400	0	12	432	0			
Nitrobenzene	98-95-3	SVOCs					µg/kg		180	400	0	12	145	0			
N-Nitroso-di-n-propylamine	621-64-7	SVOCs					µg/kg		180	400	0	12	2,680	0			
N-Nitrosodiphenylamine	86-30-6	SVOCs					µg/kg		180	400	0	12	110,000	0			
Pentachlorophenol	87-86-5	SVOCs					µg/kg		6.9	520	0	12	23,000	0			
Phenol	108-95-2	SVOCs					µg/kg		180	400	0	12	49	0			
Aroclor 1016	12674-11-2	PCBs					µg/kg		34	78	0	12	7	0			
Aroclor 1221	11104-28-2	PCBs					µg/kg		34	78	0	12	60	0			
Aroclor 1232	11141-16-5	PCBs					µg/kg		34	78	0	12	60	0			
Aroclor 1242	53469-21-9	PCBs					µg/kg		34	78	0	12	60	0			
Aroclor 1248	12672-29-6	PCBs					µg/kg		34	78	0	12	30	0			
Aroclor 1254	11097-69-1	PCBs					µg/kg		34	78	0	12	60	0			
Aroclor 1260	11096-82-5	PCBs					µg/kg		34	78	0	12	5	0			
Aroclor 1262	37324-23-5	PCBs					µg/kg		34	78	0	12	60	0			
Aroclor 1268	11100-14-4	PCBs					µg/kg		34	78	0	12	60	0			
gamma-Chlordane	5103-74-2	Pesticides	7.5	J	7.5	J	µg/kg	SW/SED11	1.7	4	1	12	3.24	1			
4,4'-DDD	72-54-8	Pesticides					µg/kg		3.4	7.8	0	12	4.88	0			

Table 4-10
Sediment Analytical Results Statistical Summary
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Analyte	CAS #	Analyte Group	Minimum Result	Q	Maximum Result	Q	Unit	Location of Maximum	Minimum Reporting Detection Limit	Maximum Reporting Detection Limit	Number of Detects	Number of Samples	RI Screening Criteria[1]	Number of Exceedances[2]	Background Sediments[3]		
															Minimum Result	Maximum Result	Background Threshold Value (95% UTL)
4,4'-DDE	72-55-9	Pesticides	2.5	J	2.5	J	µg/kg	SW/SED11	3.4	7.8	1	12	3.16	0			
4,4'-DDT	50-29-3	Pesticides	3.9	J	3.9	J	µg/kg	SW/SED11	3.4	7.8	1	12	4.16	0			
Aldrin	309-00-2	Pesticides					µg/kg		1.7	4	0	12	2	0			
alpha-BHC	319-84-6	Pesticides					µg/kg		1.7	4	0	12	6	0			
alpha-Chlordane	5103-71-9	Pesticides					µg/kg		1.7	4	0	12	3	0			
beta-BHC	319-85-7	Pesticides					µg/kg		1.7	4	0	12	5	0			
delta-BHC	319-86-8	Pesticides					µg/kg		1.7	4	0	12	6,400	0			
Dieldrin	60-57-1	Pesticides					µg/kg		3.4	7.8	0	12	1.9	0			
Endosulfan I	959-98-8	Pesticides					µg/kg		1.7	4	0	12	2.9	0			
Endosulfan II	33213-65-9	Pesticides					µg/kg		3.4	7.8	0	12	14	0			
Endosulfan Sulfate	1031-07-8	Pesticides					µg/kg		3.4	7.8	0	12	34.6	0			
Endrin	72-20-8	Pesticides					µg/kg		3.4	7.8	0	12	2.22	0			
Endrin aldehyde	7421-93-4	Pesticides					µg/kg		3.4	7.8	0	12	480	0			
Endrin Ketone	53494-70-5	Pesticides					µg/kg		3.4	7.8	0	12	NS	0			
gamma-BHC (Lindane)	58-89-9	Pesticides					µg/kg		1.7	4	0	12	3	0			
Heptachlor	76-44-8	Pesticides					µg/kg		1.7	4	0	12	0.6	0			
Heptachlor Epoxide	1024-57-3	Pesticides					µg/kg		1.7	4	0	12	2.47	0			
Methoxychlor	72-43-5	Pesticides	4.6	J	6.4	J	µg/kg	SW/SED11	17	40	2	14	13.6	0			
Toxaphene	8001-35-2	Pesticides					µg/kg		170	400	0	12	0.077	0			
Barium	7440-39-3	Metals	22	J	296		mg/kg	SW/SED11	16.6	27.3	12	12	48	8	16.9	247	**300.3**
Manganese	7439-96-5	Metals	124		1330		mg/kg	SW/SED01	1.2	2.1	10	12	630	8	55.5	2030	**2607**
Iron	7439-89-6	Metals	8720		68600		mg/kg	SW/SED06	8.3	13.7	12	12	20,000	7	5180	46000	**54231**
Zinc	7440-66-6	Metals	38.7		210		mg/kg	SW/SED07	5	8.2	12	12	120	5	32.8	275	**412.4**
Copper	7440-50-8	Metals	1.2	J	48.2		mg/kg	SW/SED11	2.1	3.4	12	12	16	4	5.2	122	**130.6**
Cadmium	7440-43-9	Metals	0.1	J	1.2		mg/kg	SW/SED11 SW/SED11	0.41	0.68	7	12	0.6	3	0.17	1.6	**2.084**
Lead	7439-92-1	Metals	4.8	J+	76.8		mg/kg	SW/SED11	1	0.98	12	12	31	3	9.1	97.4	**131.1**
Nickel	7440-02-0	Metals	2.7	J	70.3		mg/kg	SW/SED07	3.3	5.5	11	12	16	3	0.19	87.9	**21.22**
Arsenic	7440-38-2	Metals	1.4		23.9		mg/kg	SW/SED11	1	0.98	12	12	6	2	1.8	38.9	**38.9**
Antimony	7440-36-0	Metals	0.32	J	3.7	J	mg/kg	SW/SED11	5	8.2	11	12	3	1	0.38	2.6	**2.991**
Aluminum	7429-90-5	Metals	2180		8920		mg/kg	SW/SED12	16.6	27.3	12	12	25,500	0			
Beryllium	7440-41-7	Metals	0.5		1.5		mg/kg	SW/SED06	0.41	0.68	8	12	160	0			
Calcium	7440-70-2	Metals	1650		36800	J	mg/kg	SW/SED03	414	683	12	12	NS	0			
Chromium	7440-47-3	Metals	1.9		16.1		mg/kg	SW/SED10	1	0.98	12	12	26	0			
Cobalt	7440-48-4	Metals	2.2	J	15.5		mg/kg	SW/SED10	4.1	6.8	12	12	50	0			
Magnesium	7439-95-4	Metals	1040		22800	J	mg/kg	SW/SED03	414	683	12	12	NS	0			
Mercury	7439-97-6	Metals	0.013	J	0.17		mg/kg	SW/SED05	0.1	0.18	7	12	0.174	0			
Potassium	7440-09-7	Metals	56.9	J	868		mg/kg	SW/SED10	414	683	12	12	NS	0			
Selenium	7782-49-2	Metals	0.54	J	0.54	J	mg/kg	SW/SED11	2.9	4.8	1	12	2	0			
Silver	7440-22-4	Metals					mg/kg		1	0.98	0	12	0.5	0			
Sodium	7440-23-5	Metals	89.3	J	433	J	mg/kg	SW/SED11	414	683	12	12	NS	0			
Thallium	7440-28-0	Metals					mg/kg		2.1	3.4	0	12	0.78	0			
Vanadium	7440-62-2	Metals	9.2		31.4		mg/kg	SW/SED06	4.1	6.8	12	12	390	0			
Total Organic Carbon	TOC	Other	1760		113000		mg/kg	SW/SED11	399	8510	3	3	NS	0			

Notes:
1. RI screening criteria are summarized on Table 4-1 through 4-2.
2. The exceedances of screening criteria column is color coded from green to red to show the relative amount of exceedances for each compound.
3. Background samples were collected from unimpacted areas and utilized to calculate a background threshhold value (BTV) to compare to RI sampling results .

Acronyms:
- J - estimated value
- mg/kg - miligrams per kilogram
- ND - analyte not detected in background samples
- NS - no standard
- PCBs - polychlorinated biphenyls
- Q - data qualifier
- SVOCs - semi-volatile organic compounds
- VOCs - volatile organic compounds
- µg/kg - micrograms per kilogram

Table 5-1
Fate and Transport Properties for Site-Related Contaminants
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

Chemical	Chemical Characteristics						
	Specific Gravity	Molecular Weight	Water Solubility @25°C	Vapor Pressure @25°C	Henry's Law Constant H	K_{oc}	log K_{ow}
		(g/mole)	(mg/L)	(mm Hg)	(atm-m^3/mol)	(mL/g)	
Trichloroethene	1.46	131.0	1,280	69	0.018	61	2.4
cis-1,2-Dichloroethene	1.28	96.9	6,410	201	0.00408	40	1.9

Volatilization from Water is	"Low"	if H <	1E-07
	"High"	if H >	1E-03
	"Moderate"	if H is in-between	

NOTATION

K_{oc} - Soil Organic Carbon/Water Partition Coefficient, cm3/g

K_{ow} - n-Octanol/Water Partition Coefficient, dimensionless

°C - degrees Celsius

g/mole - gram per mole

mg/L- milligram per liter

mm Hg - millimeter of mercury

atm-m^3/mol - atmosphere cubic meters per mole

mL/g - milliliter per gram

References:

1. EPA. 2017. Regional Screening Levels for Chemical Contaminants at Superfund Sites. June.
2. EPA. 2004. User's Guide for Evalauting Subsurface Vapor Intrusion into Buildings. February.
3. Risk Assessment Information System (http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef)
4. Freeze, R.A. and Cherry, J.A. 1979. Groundwater.
5. NJDEP. 2013. Chemical Properties for Calculation of Impact to Ground Water Soil Remediation Standards. November.

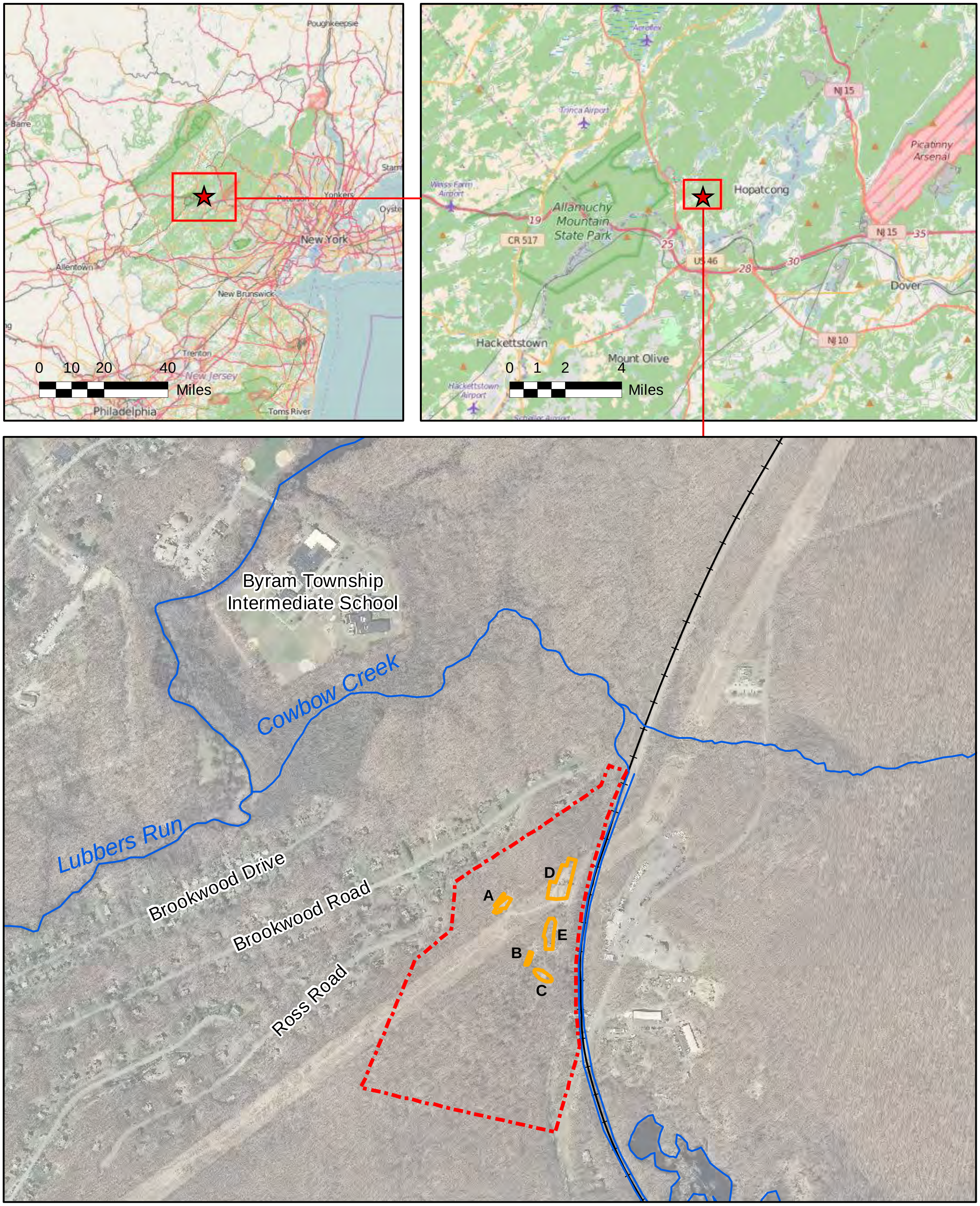
Table 5-2
MNA Parameters
Mansfield Trail Dump Site, Operable Unit 2
Byram Township, New Jersey

		Dump Zone E	Dump Zone D	Former Dump Zone A							Downgradient of Dump Zone A			Farther Downgradient	
				Shallow		Deep	Shallow			Deep	Wells approximately equal distance downgradient				
Sample ID		MLS-6-3-R2	MLS-7-3-R2	MLS-3-1-R2	MLS-3-2-R2	MLS-3-4-R2	MLS-4-1-R2	MLS-4-2-R2	MLS-4-3-R2	MLS-4-5-R2	MLS-9-5-R2	MW-9-R2	MW-10-R2	MLS-13-3-R2	MW-13-R2
Sample Date		11/15/2017	11/16/2017	11/7/2017	11/7/2017	11/7/2017	11/8/2017	11/8/2017	11/8/2017	11/15/2017	11/21/2017	11/3/2017	11/3/2017	11/21/2017	11/2/2017
PCE and degradation byproducts															
Tetrachloroethene	µg/L	0.5 U	0.14 J	0.34 J	0.15 J	0.54	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	µg/L	2.1	18	82	85	33	160	140	150	140	36	3.6	6.2	23	11
cis-1,2-Dichloroethene	µg/L	8.5	12	19	13	15	5.7	6	7.7	15	23	1	2.6	11	3.4
Vinyl Chloride	µg/L	1.3	0.44 J	0.67	0.63	3.3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethane	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Ethene	µg/L	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Compound Specific Isotope Analysis															
13C/12C-Tetrachloroethene	--	NM	NM	NM	NM	NM	NM	NM	NM	-35.3	NM	NM	NM	NM	NM
13C/12C-Trichloroethene	--	-19.3	-18.5	-53.7	-54.7	-38.8	-56.5	-56.2	-56.1	-52.3	-47	-46.5	-48.8	-49	-47.4
13C/12C-cis-1,2-Dichloroethene	--	-21.4	-21.4	-47.7	-46.9	-41.1	-44.1	-45.1	-46.2	-46.5	-44.6	-41.4	-43.6	-43.2	-42.5
13C/12C-Vinyl Chloride	--	-9.1	NM	NM	NM	-56.1	NM	NM	NM	NM	NM	NM	NM	NM	NM
Organic Carbon															
Total Organic Carbon	mg/L	1 U	2.3	1 U	1 U	1 U	1 U	1 U	1 U	3.6	1.1	1 U	1.1	1 U	1 U
ReDox Parameters															
Dissolved Oxygen	mg/L	2.09	2.3	4.71	4.2	2.34	6.39	6.01	2.57	1.46	4.32	3.25	8.52	4.7	6.35
Oxidation-Reduction Potential	mV	83	26	-49.5	-102	-20.3	101.8	168	181.6	252	123	42.7	41	231	110.5
Nitrate + Nitrite [As N]	mg/L	0.05 U	0.05 U	0.98	0.43	0.05 U	0.56	0.54	0.47	0.05 U	3.1	1.8	0.38	1.3	3.4
Ferrous Iron	mg/L	NR	NR	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	NR	0.02 U	0.02 U	NR	NR
Sulfate	mg/L	17	18	14	15	13	19	19	21	14	19	37	12	20	19
Sulfide	mg/L	0.01 U	0.026	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Methane	µg/L	167	517	78.1	181	517	2 U	4.14	12.1	124	458	2 U	2 U	2 U	10.6
Microbiology															
Sulfate Reducing Bacteria	cells/mL	65000	181000	182000	120000	75600	3890	10100	47800	159000	507000	4.8 U	4.6 U	379	4.9 U
Total Eubacteria	cells/mL	449000	505000	1010000	1580000	618000	184000	268000	1290000	2080000	1180000	257	252	841000	372
Methanogens MGN	cells/mL	534	2500	86.3	545	116	1.4 J	0.3 J	762	1460	175	4.8 U	4.6 U	0.2 J	4.9 U
Reductive Dechlorination															
Dehalococcoides spp.	cells/mL	8.8	0.4 J	25.1	4	2720	0.5 U	0.5 U	0.5 U	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
TCEA	cells/mL	0.5 U	0.8	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
BVCA	cells/mL	0.4 J	0.5 U	5.4	0.5 J	539	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VCRA	cells/mL	0.5 U	0.5 U	0.5 U	0.5 U	130	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dehalobacter DCM	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
DCM Reductase	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Dehalobium spp.	cells/mL	7960	1030	257	654	584	40	321	701	986	396	4.8 U	4.6 U	5.1 U	4.9 U
Dehalobacter spp.	cells/mL	3630	19200	5380	18300	10600	1880	1880	8590	59800	9280	4.8 U	4.6 U	114	4.9 U
Dehalogenimos spp.	cells/mL	4.9 U	665	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Desulfitobacterium spp.	cells/mL	8270	21700	11200	30500	11400	2040	2800	16000	81700	7000	4.8 U	4.6 U	94.1	4.9 U
Desulfuromos spp.	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	56.1	20.4	4.8 U	4.6 U	5.1 U	4.9 U
Chloroform reductase	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	191	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
1,1 DCA reductase	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
1,2 DCA Reductase	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Aerobic (Co)Metabolic															
Ethene Monooxygenase	cells/mL	4.9 U	4.9 U	4.9 U	45.2	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Particulate methane monooxygenase	cells/mL	4.9 U	9.6	4.9 U	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	15.1	4.9 U
Soluble methane monooxygenase	cells/mL	78.4	71.3	39.3	124	4.8 U	5 U	25.4	43.9	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Epoxyalkane transferase	cells/mL	4.9 U	4.9 U	229	4.8 U	4.8 U	5 U	4.9 U	4.8 U	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Phenol Hydroxylase	cells/mL	180	1370	255	370	40.1	192	315	1050	244	186	2.5 J	4.6 U	24.9	4.9 U
Toluene Monooxygenase 2	cells/mL	4.9 U	1330	7660	2450	100	1630	1860	8610	1400	97.7	4.8 U	4.6 U	178	4.9 U
Toluene Monooxygenase	cells/mL	816	3860	722	798	35.9	125	4.9 U	4.8 U	4.8 U	1050	4.8 U	4.6 U	5.1 U	4.9 U
Tetra-Trichlorobenzene Dioxygenase	cells/mL	4.9 U	4.9 U	4.9 U	4.8 U	4.8 U	5 U	4.9 U	177	38.7	5 U	4.8 U	4.6 U	5.1 U	4.9 U
Toluene Dioxygenase	cells/mL	845	4.9 U	700	2230	4.8 U	728	806	2190	4.8 U	5 U	4.8 U	4.6 U	5.1 U	4.9 U

Acronyms:

MNA - monitored natural attenuation
µg/L - microgram per liter
mV - millivolt
NR - not reported
U - non-detect
PCE - tetrachloroethene
mg/L - milligram per liter
cells/mL - cells per milliliter
NM - not measured
J - estimated

Figures



Images adapted from EES JV Revised Data Evaluation Summary Report (2016)

Figure 1-1
Site Location Map
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

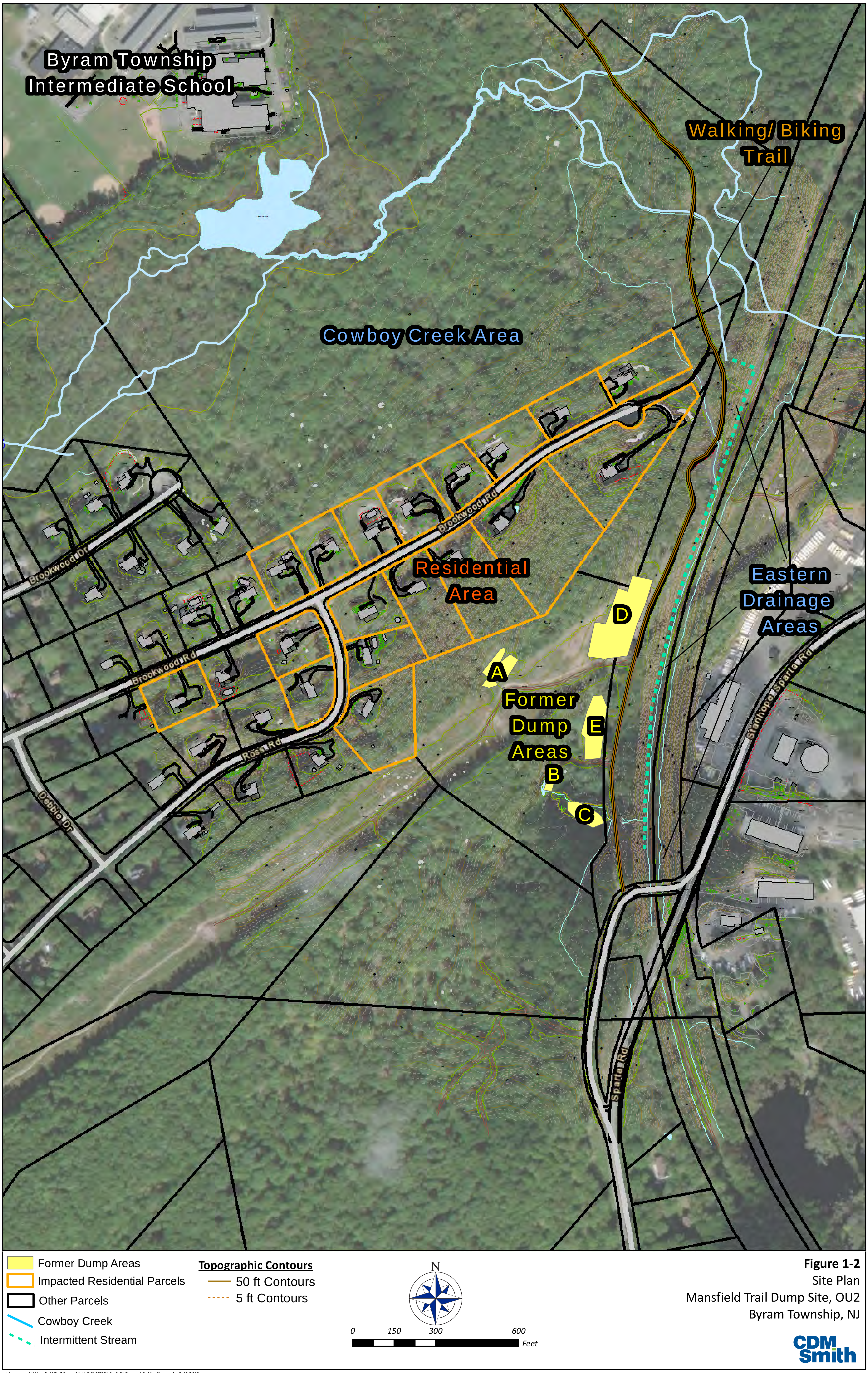


Figure 1-2
Site Plan
Mansfield Trail Dump Site, OU2
Byram Township, NJ

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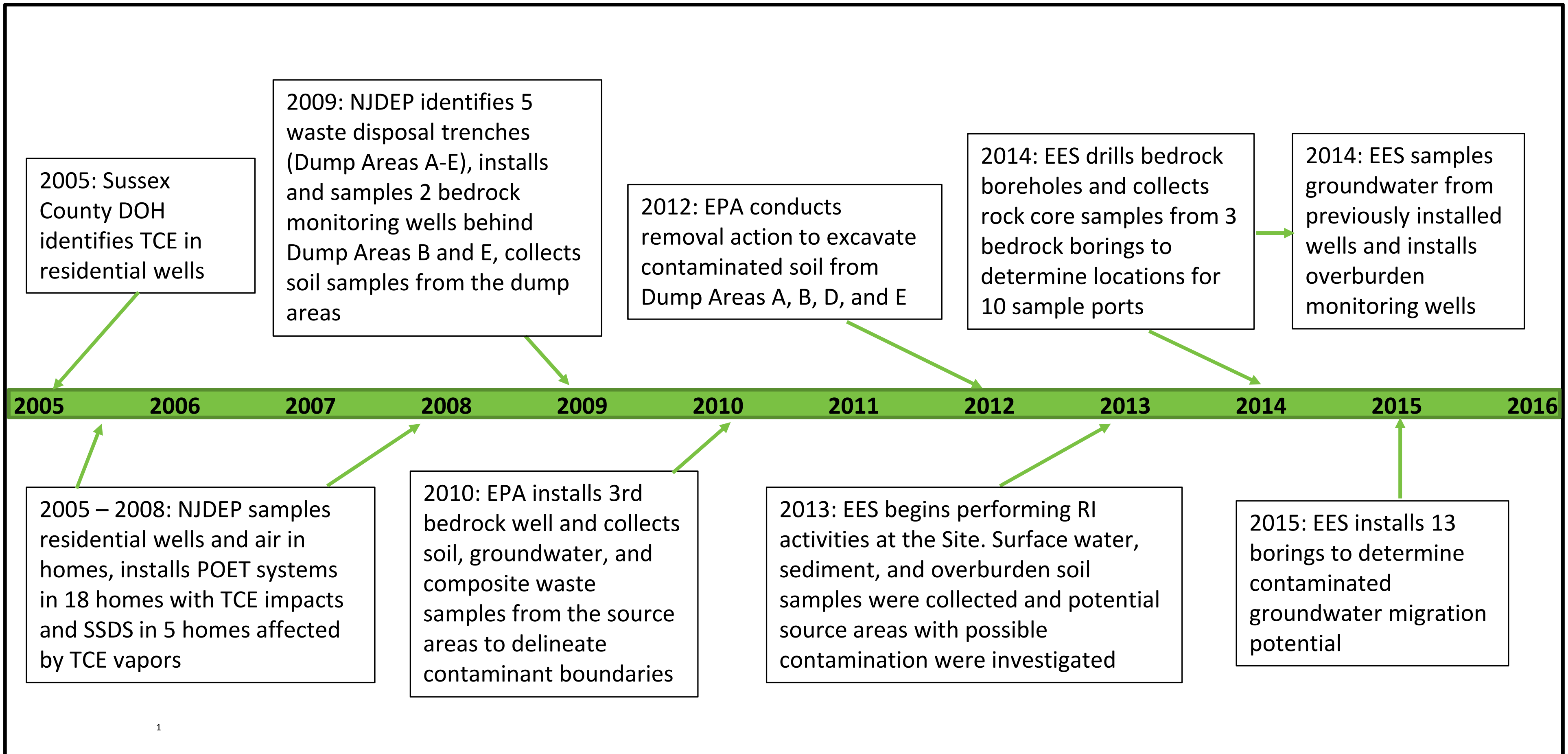
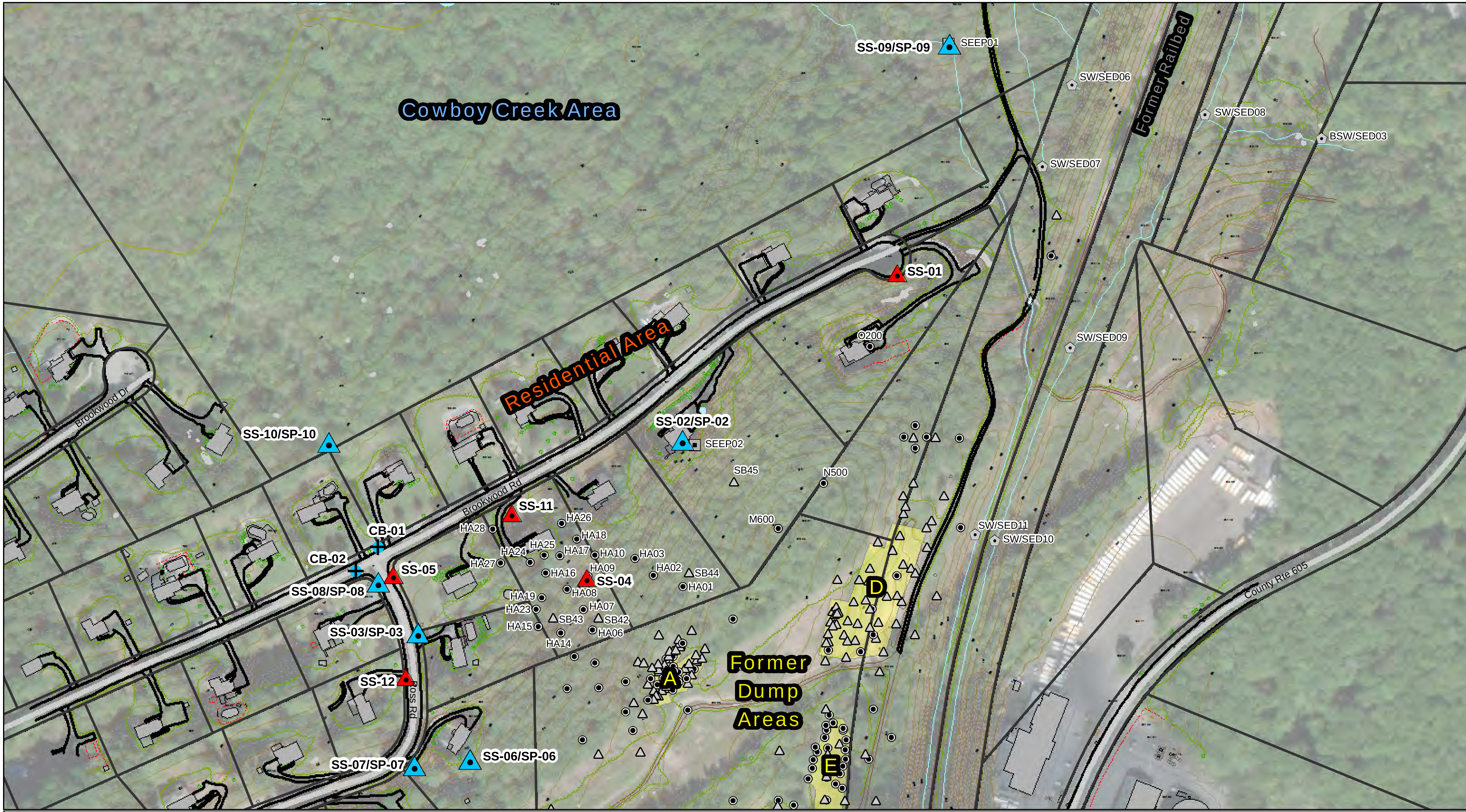


Acronyms
DOH: Department of Heath
EES: Engineering and Environmental Solutions
EPA: U.S. Environmental Protection Agency
NJDEP: New Jersey Department of Environmental Protection
RI: remedial investigation
TCE: trichloroethene

CDM Smith

Figure 1-3
Previous Investigations Timeline
Mansfield Trail Dump, OU2
Bryam Township, NJ



2017 RI Sampling Locations

- Surface Soil
- Seep and Surface Soil
- Catch Basin Water
- Former Dump Areas
- Tax Parcels

Initial RI Sampling Locations

- Historic Soil Boring
- Historic Surface Soil
- Historic Sediment/ Surface Water Sample
- Historic Seep Sample

Topographic Contours

- 50 ft Contours
- 5 ft Contours

N

0 100 200 400 Feet

Figure 2-1
Residential Area Seep and Soil Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

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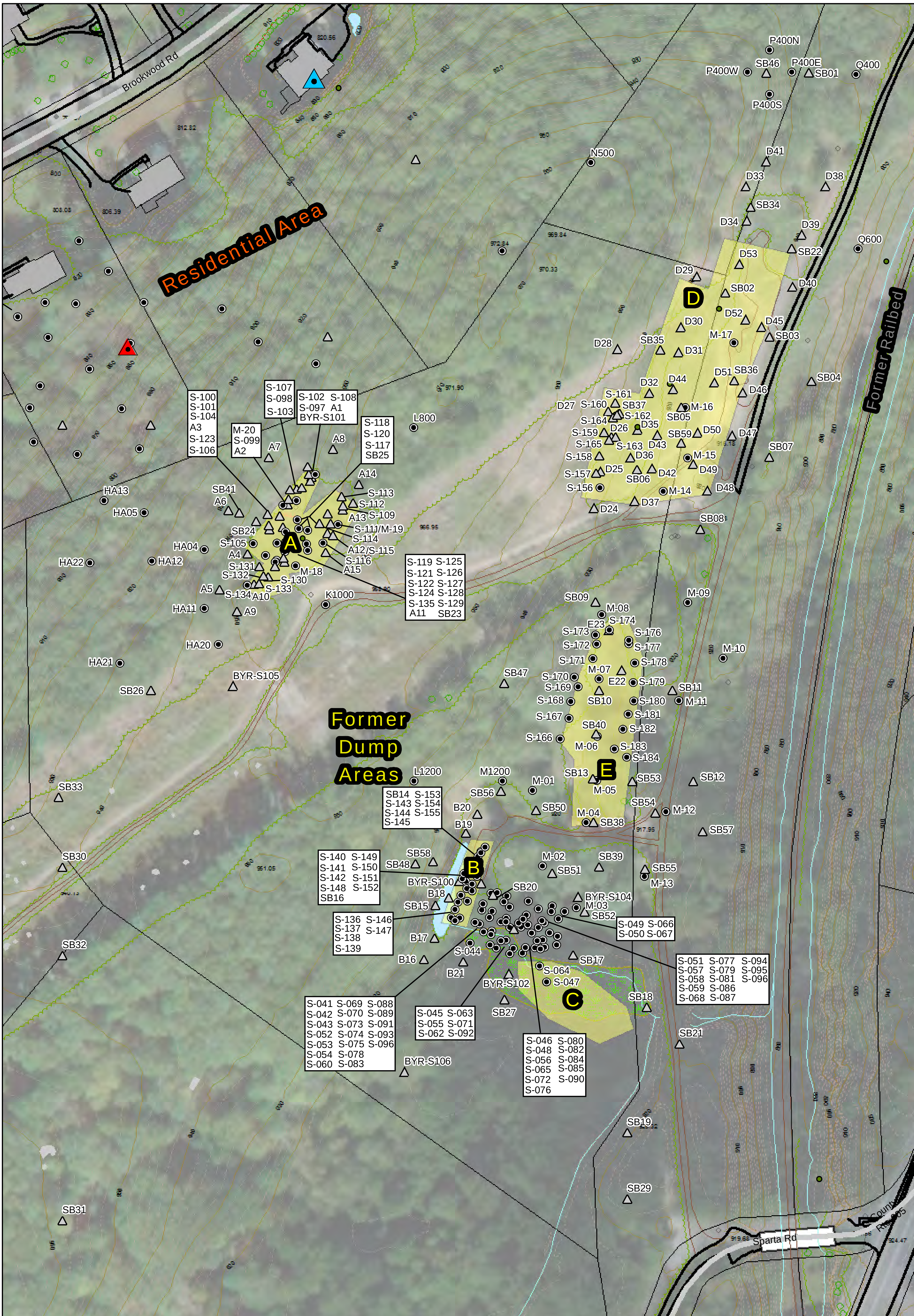


2017 RI Sampling Locations
- Surface Soil
- Seep and Surface Soil
- Catch Basin Water
- Former Dump Areas
- Tax Parcels

Initial RI Sampling Locations
- Historic Soil Boring
- Historic Surface Soil
- Historic Sediment/ Surface Water Sample
- Historic Seep Sample

Topographic Contours
- 50 ft Contours
- 5 ft Contours

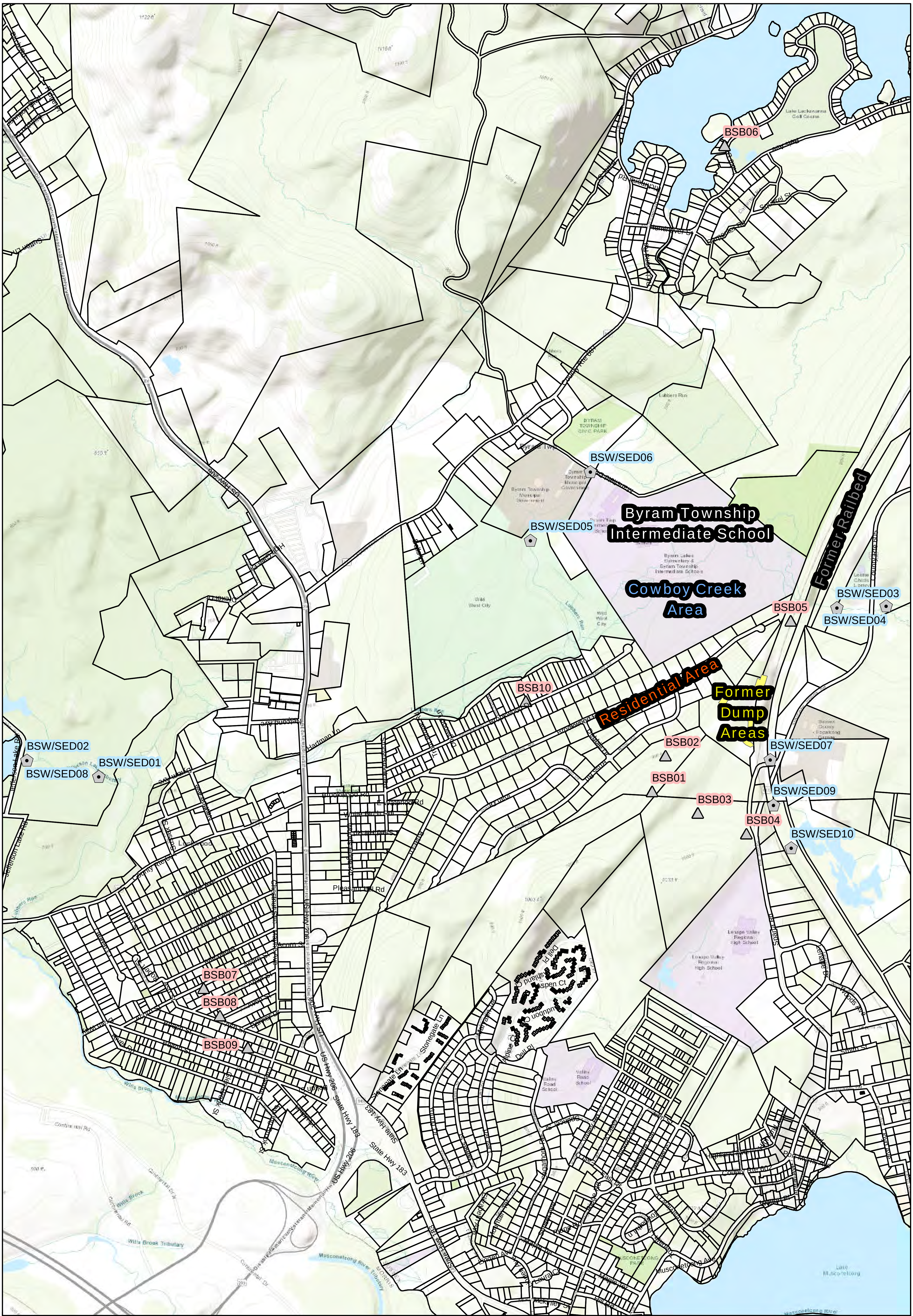
N

0 50 100 200 Feet

Figure 2-2
Source Area Soil Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\JMS\GIS\Mansfield Trail Dump Site\MXD\07\RI\Draft RI\Fig_2-2_Source Area Soil Sampling Locations.mxd 5/5/2019



Initial RI Background Locations

- Historic Soil Boring
- Historic Surface Soil
- Historic Sediment/ Surface Water Sample
- Former Dump Areas
- Tax Parcels

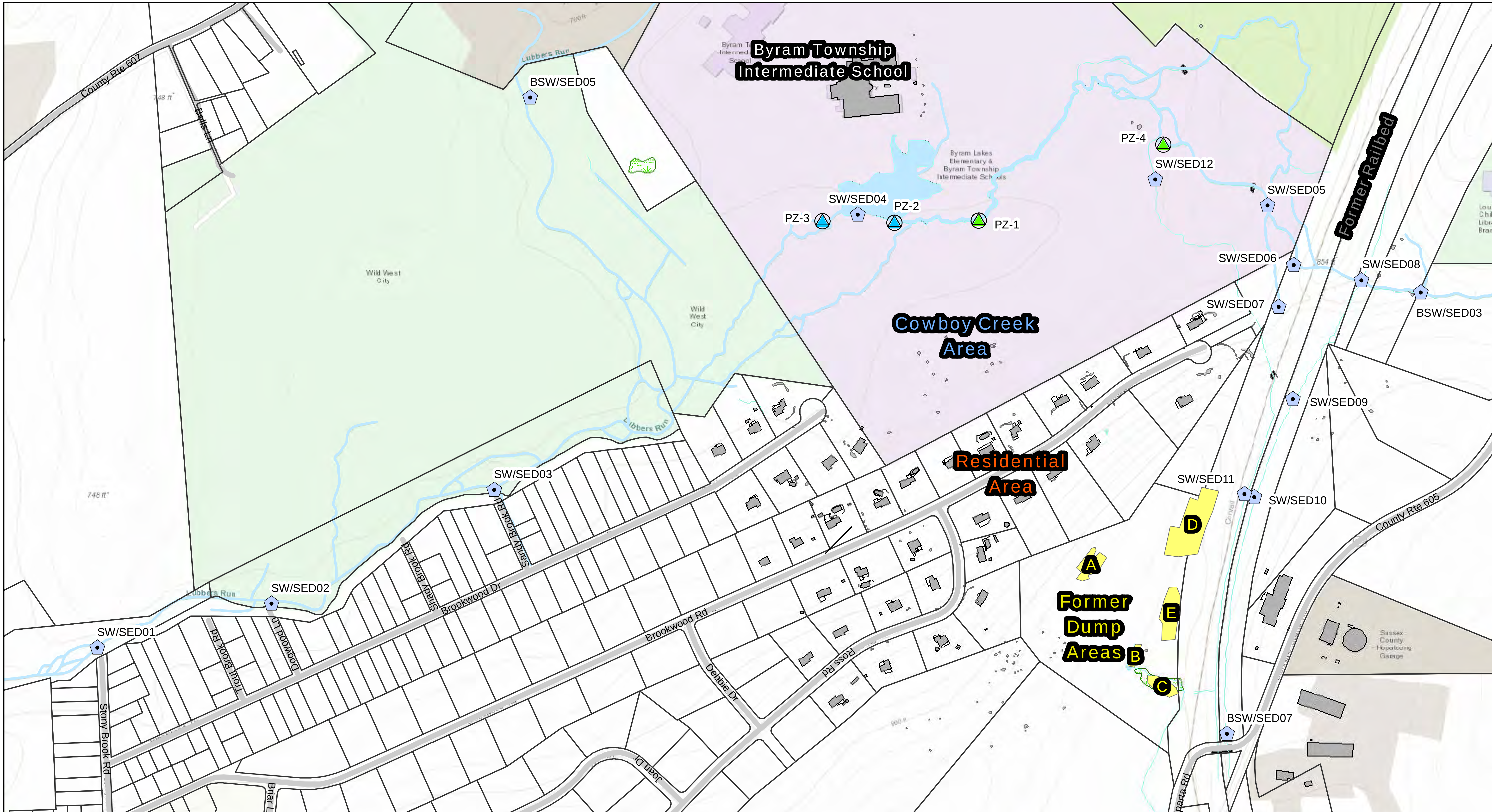
N

0 550 1,100 2,200 Feet

Figure 2-3
Background Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\JMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_2-3_Background Sampling Locations.mxd 4/23/2018



2017 RI Sampling Locations

In-Creek Piezometer (Surface Water and Sediment Co-Located)

Initial RI Sampling Locations

2014 Sediment/ Surface Water Sample

Existing In-Creek Piezometer (co-located surface water and sediment sample)

Former Dump Areas

Tax Parcels

N

0 200 400 800 Feet

Figure 2-4

Surface Water and Sediment Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer

Tax Parcels
Former Dump Areas

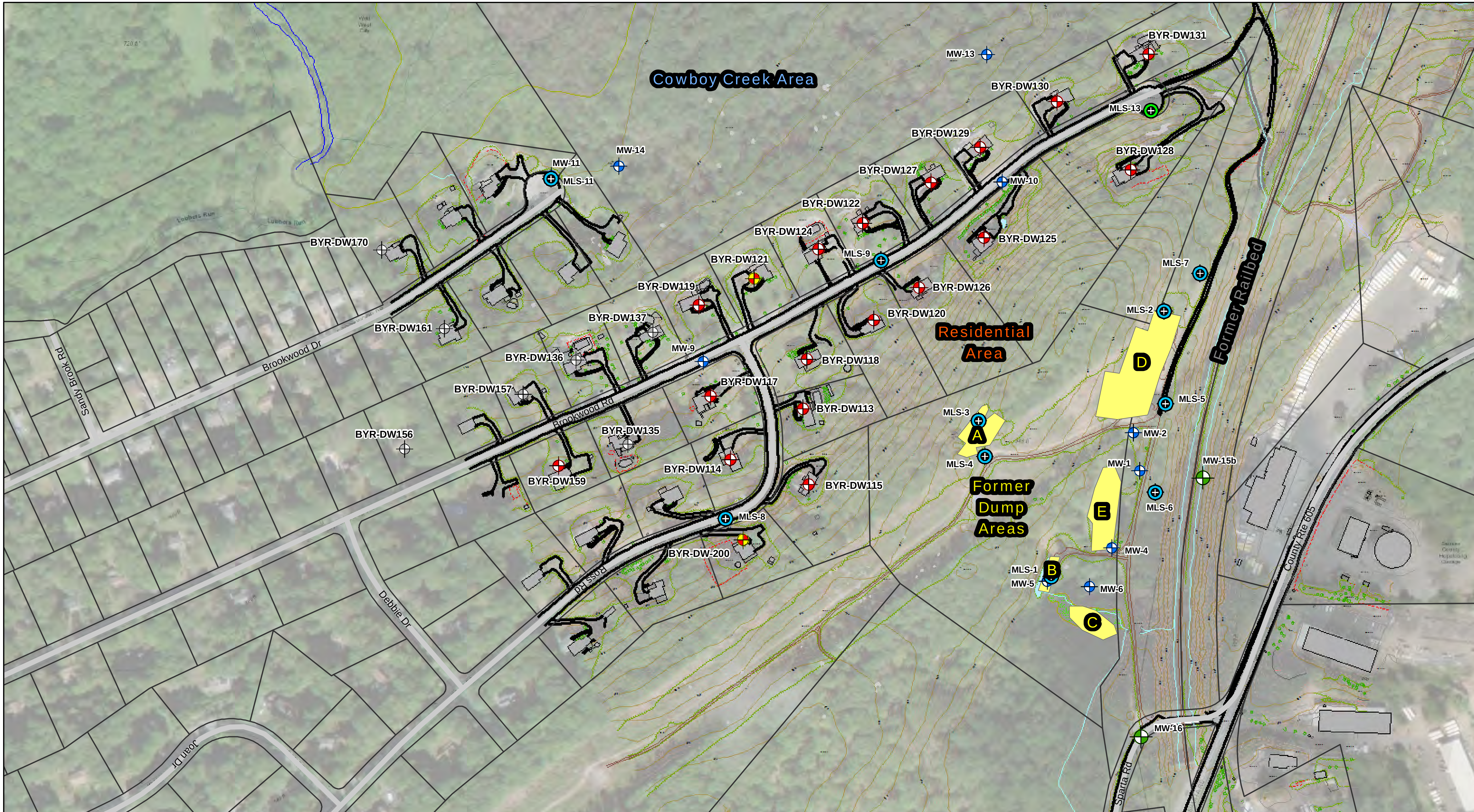
N

0 125 250 500 Feet

Figure 2-5
Monitoring Well Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\07d\RI\Draft RI\Figure 2-5_Monitoring Wells_rev.mxd 5/1/2019



- 2017 Monitoring Well
- 2017 MLS Well
- Existing Monitoring Well
- Existing MLS Well
- Residential Well with Poet (R2 sample Location)
- Residential Well with POET (no R2 sample)
- Indoor Air Sampling Location
- Tax Parcels
- Former Dump Areas

Topographic Contours

- 50 ft Contours
- 5 ft Contours

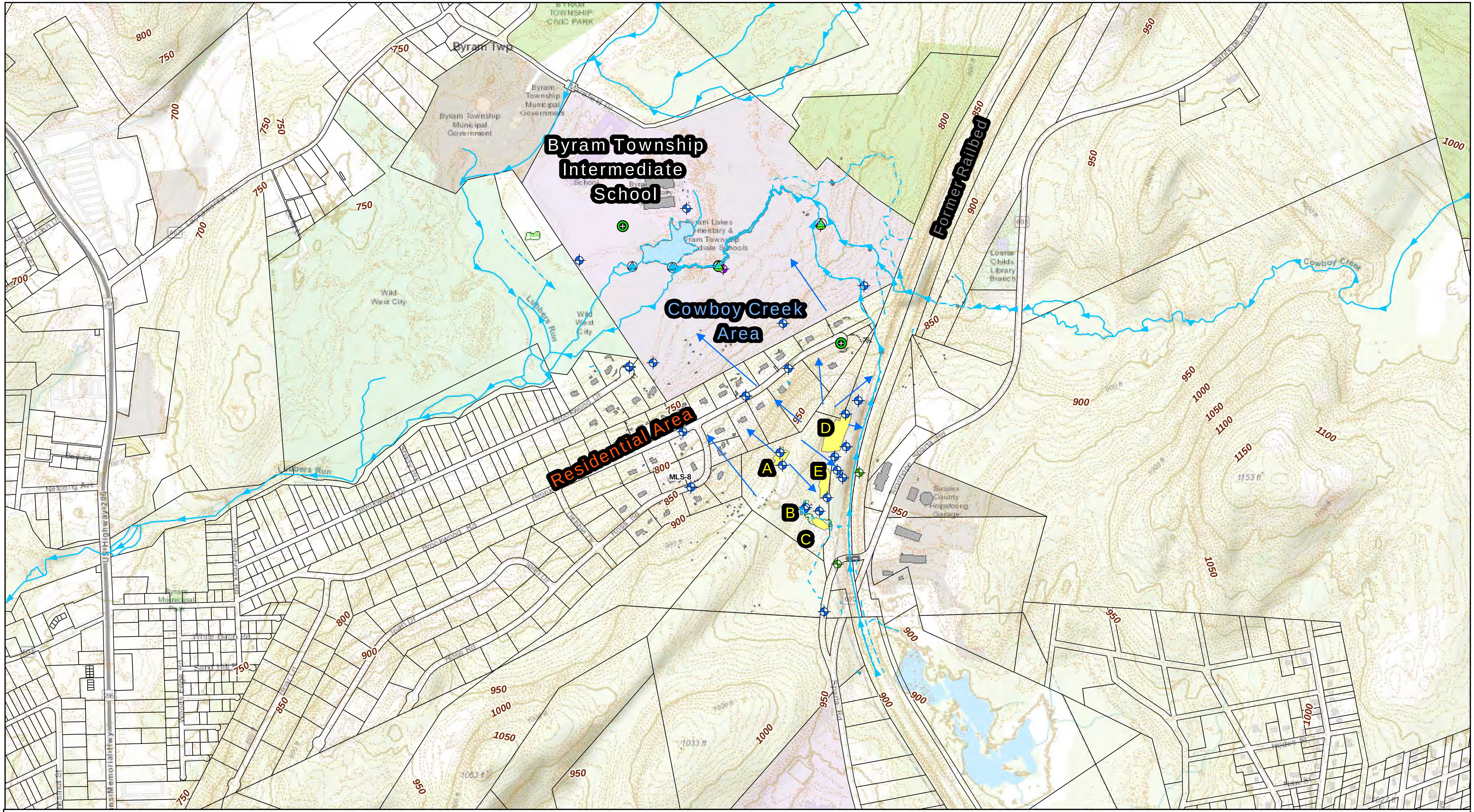
N

0 125 250 500 Feet

Figure 2-6
Residential Sampling Locations
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure 2-6_REZ_Wells.mxd 4/26/2019



2017 Monitoring Well

2017 MLS Well

2017 In-Creek Piezometer

2017 Overburden Piezometers

Existing Monitoring Well

Existing MLS Well

Existing In-Creek Piezometer

Tax Parcels

Former Dump Areas

Drainage Pathways

Runoff

Surface Water (streams or intermittent streams)

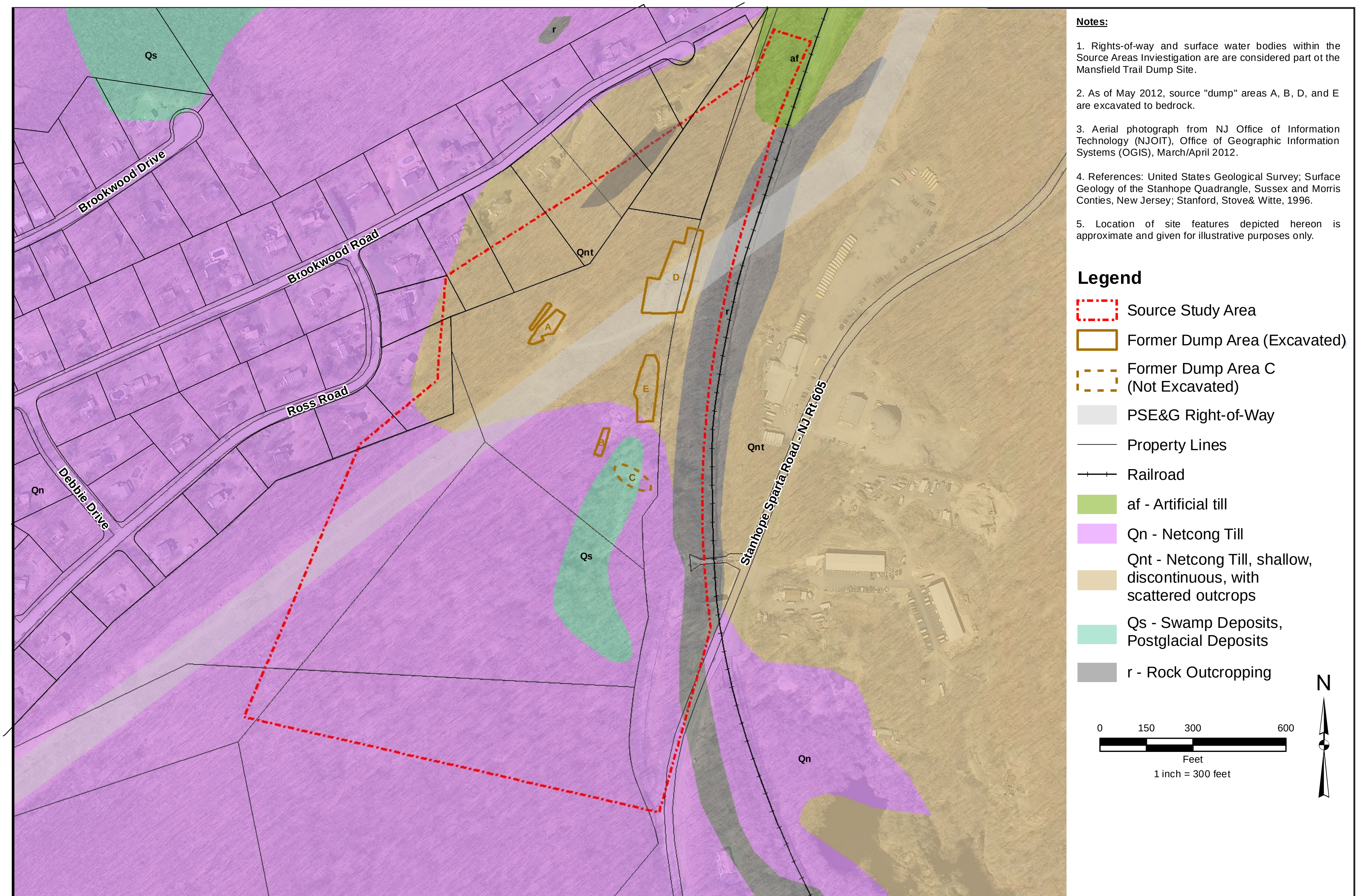
Topographic Contours

50 ft Contours

5 ft Contours

Figure 3-1
Site Topography and Drainage
Mansfield Trail Dump Site, OU2
Byram Township, NJ

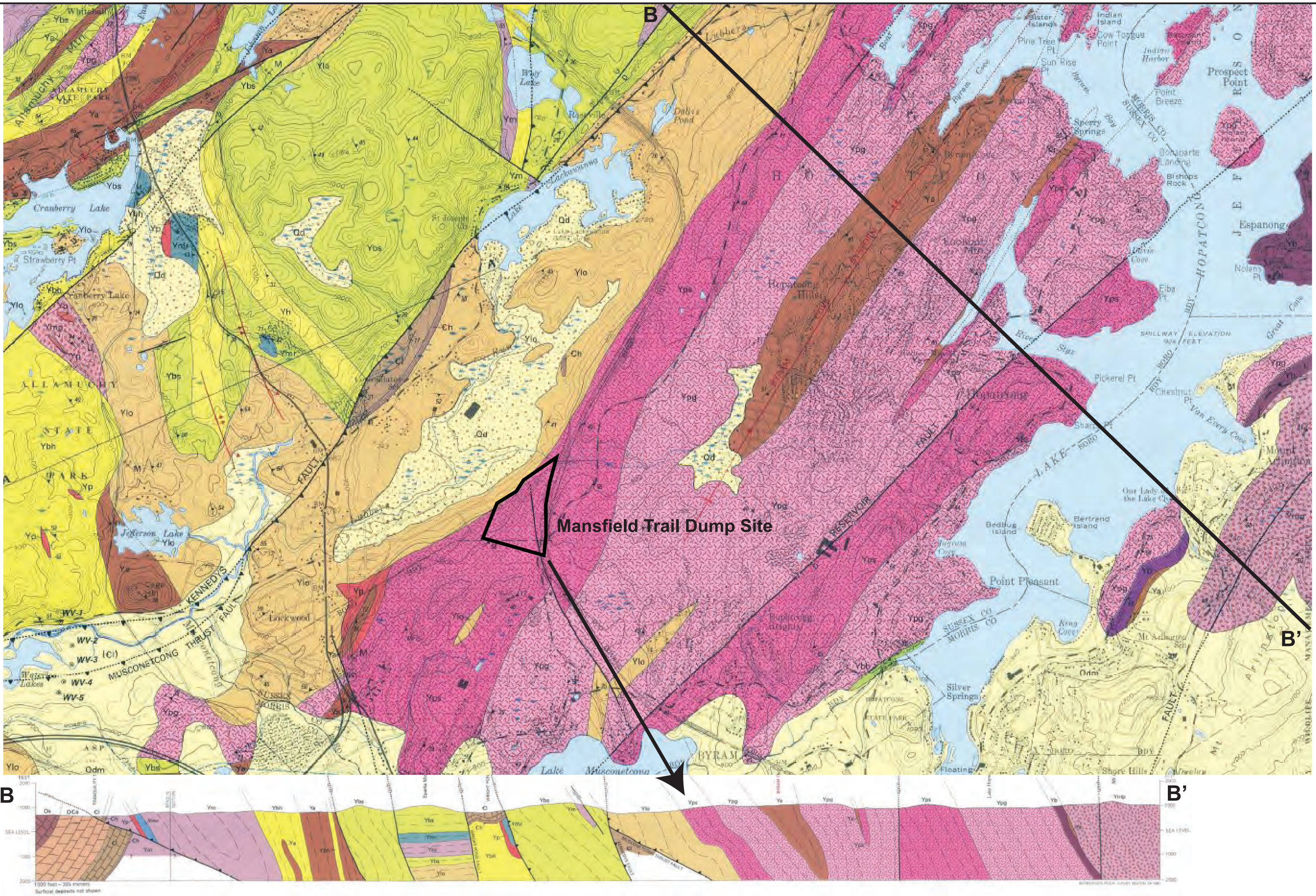
ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_3-1_Site_Topo_revised.mxd 4/19/2018



Adapted from Data Evaluation Summary Report (EES JV, 2016)

CDM Smith

Figure 3-2
Regional Surficial Geology
Mansfield Trail Dump Site, OU2
Byram Township, NJ



Adapted from Volkert et al.1989

- Qd — Quaternary deposits - alluvium, glacial
- Ypg — Pyroxene granite (Middle Proterozoic)
- Yps — Pyroxene syenite (Middle Proterozoic)
- Ylo — Quartz-oligoclase gneiss (Middle Proterozoic)

Contact - Dotted where concealed
Faults - Dotted wehere concealed. Queried where doubtful
Tear fault - Arrows indicate relative horizontal movement where known
U / D High angle fault - U, upthrown side; D, downthrown side
Inclinded thrust fault - Sawteeth on upper plate

N

0 — 1 Mile

CDM Smith

Figure 3-3
Regional Bedrock Geology
Mansfield Trail Dump Site, OU2
Byram Township, NJ

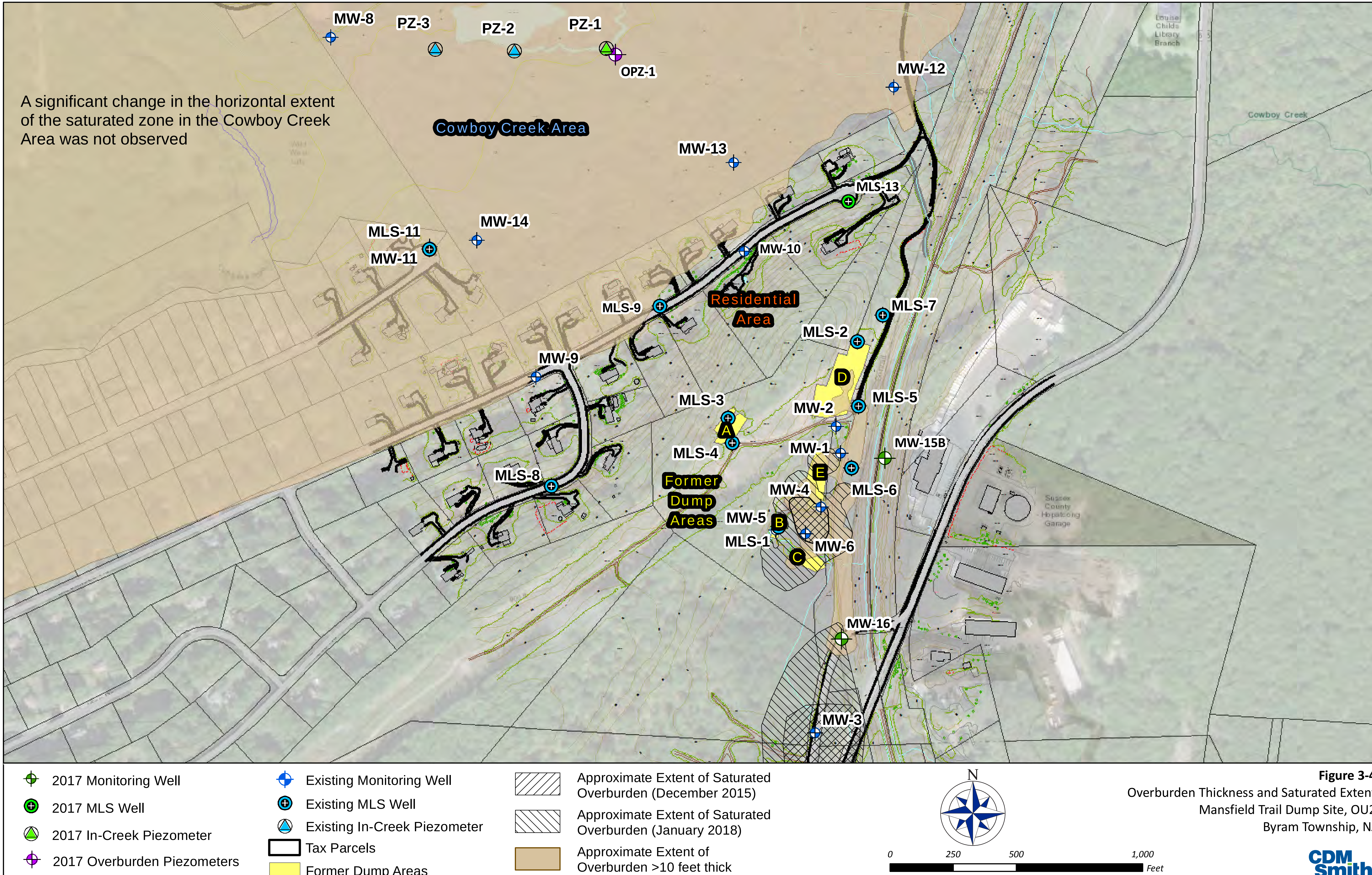


Figure 3-4
Overburden Thickness and Saturated Extent
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

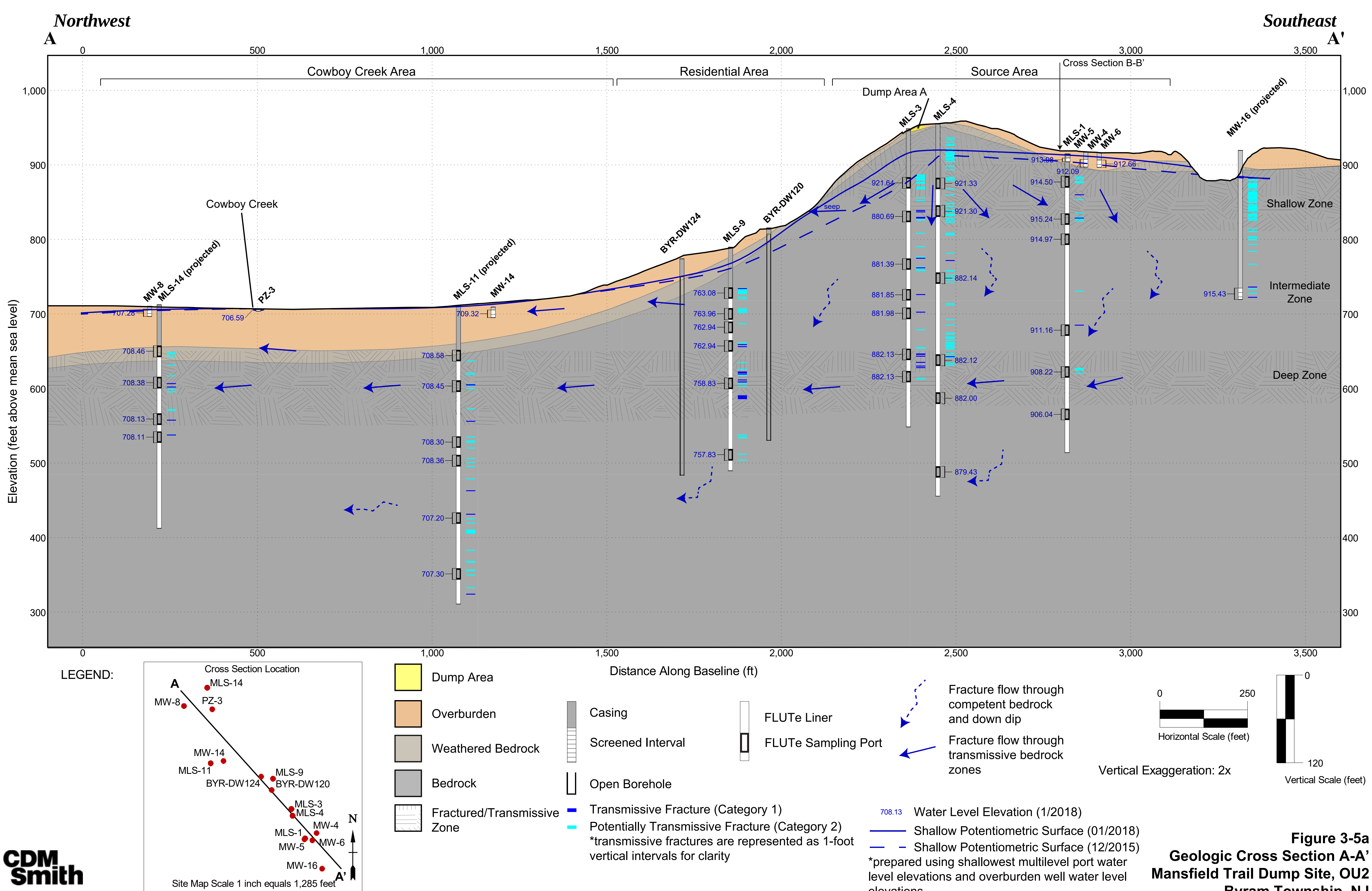


Figure 3-5a
Geologic Cross Section A-A'
Mansfield Trail Dump Site, OU2
Byram Township, NJ

STANDARD CROSS SECTION: MANSFIELD MANSFIELD.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 4/10/18 REV.

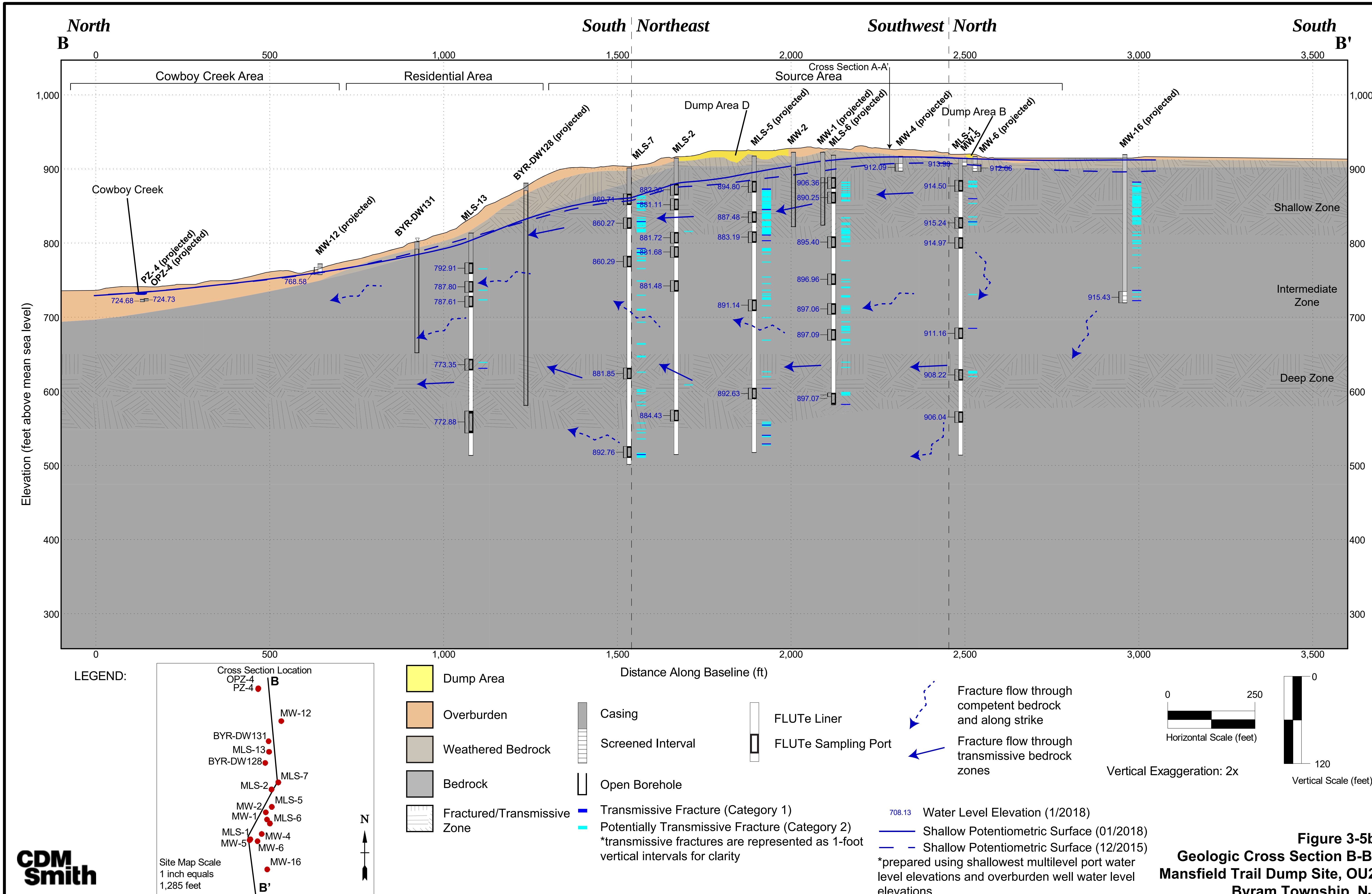
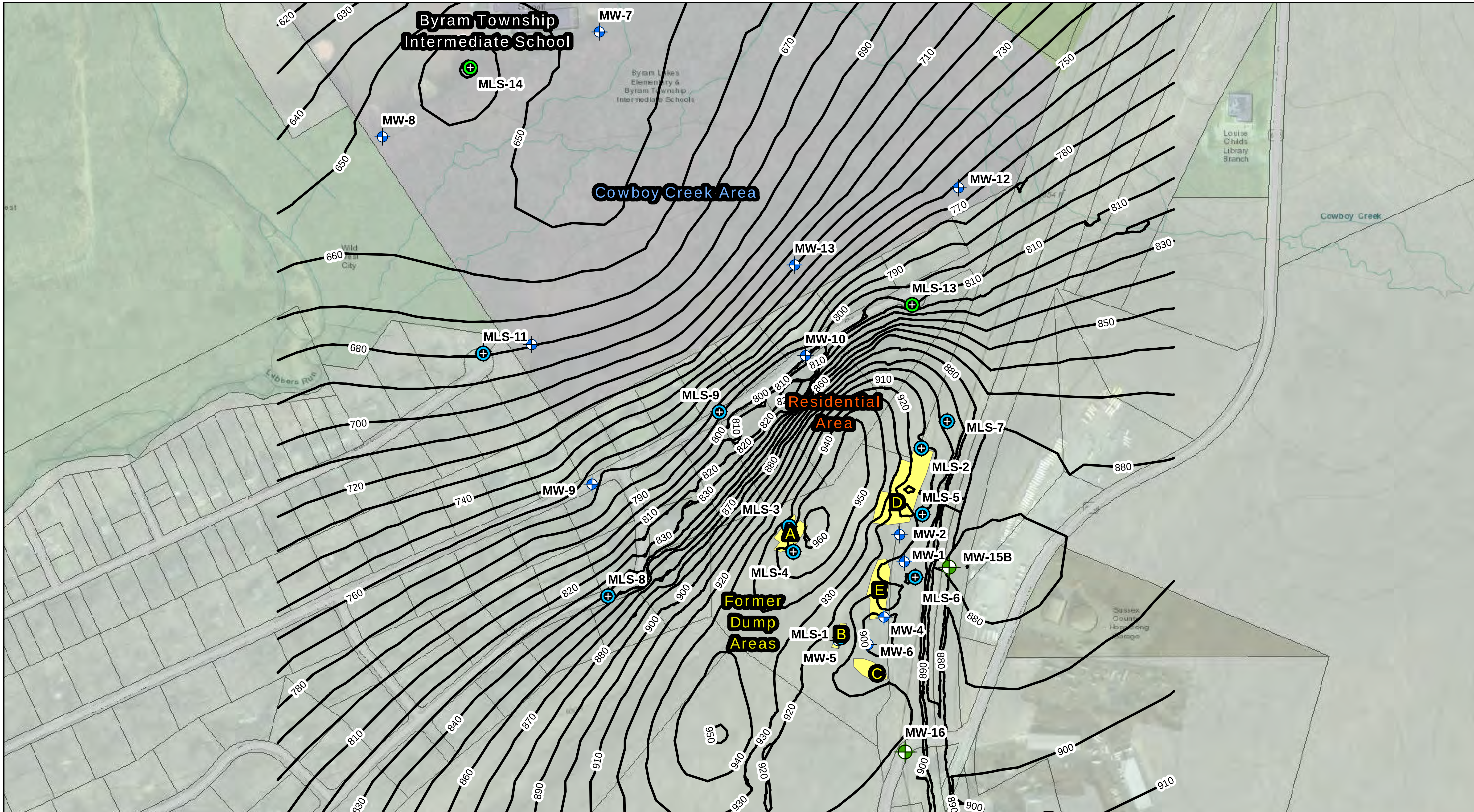


Figure 3-5b
Geologic Cross Section B-B'
Mansfield Trail Dump Site, OU2
Byram Township, NJ

STANDARD CROSS SECTION: MANSFIELD MANSFIELD.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 4/12/18 REV.



2017 Monitoring Well
2017 MLS Well
Existing MLS Well
Existing Monitoring Well
Tax Parcels
Former Dump Areas
Approximate top of bedrock elevation (feet amsl)

N

0 175 350 700 Feet

Figure 3-6
Bedrock Surface Topography
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

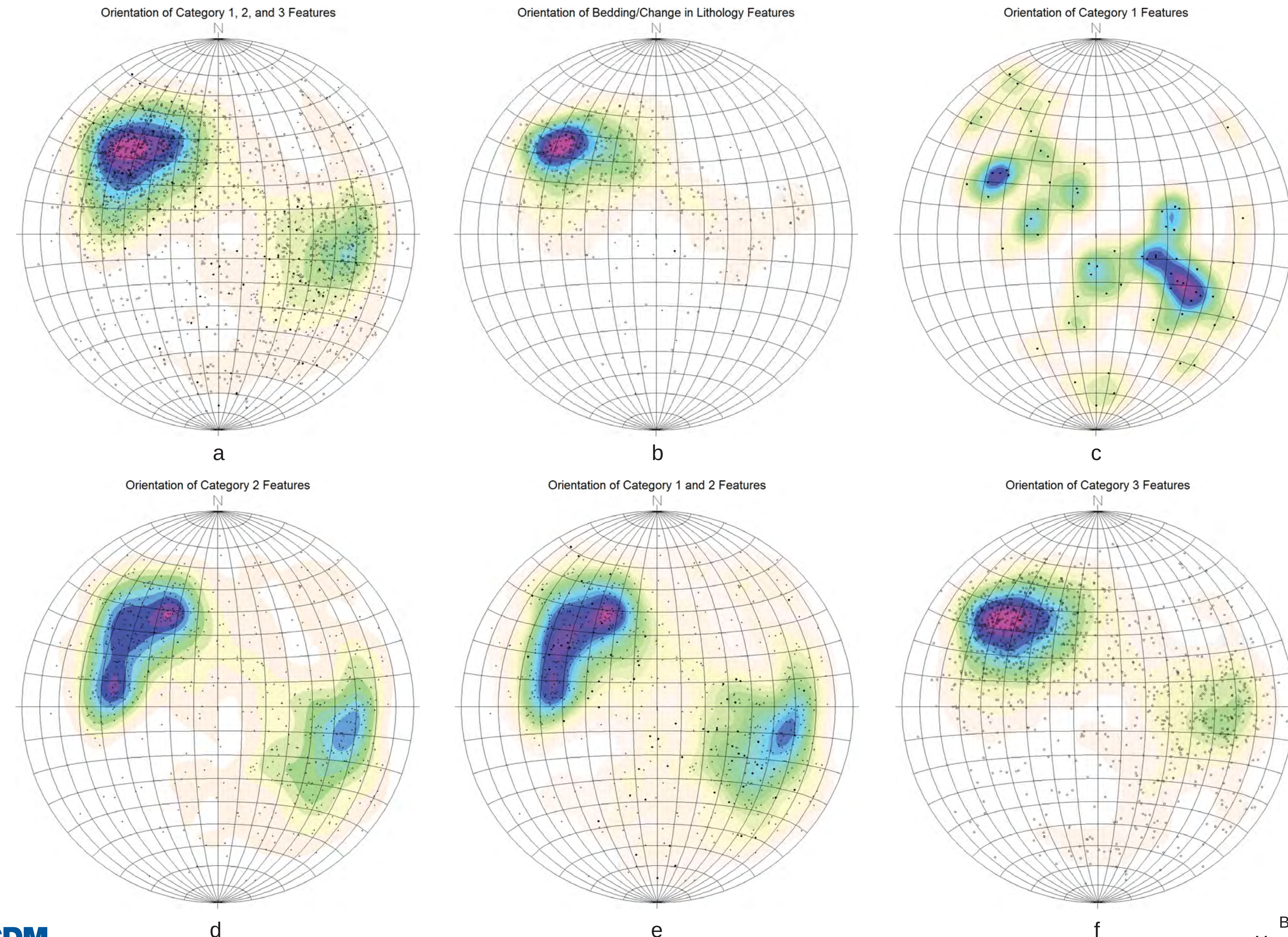


Figure 3-7
Bedrock Feature Stereonets
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MW-5 Monitoring Well
356.11 Water level (ft above amsl)

Potentiometric Surface Contour (feet amsl)

Notes
1. Groundwater levels are presented from January 2018.
2. Acronyms:
amsl - above mean sea level

N

0 125 250 500
Feet

Figure 3-8
Shallow Bedrock Groundwater Flow (Source Zone)
January 2018
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_3-8_R2_OB_WL.mxd 5/5/2019

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MW-5 Monitoring Well
356.11 Water level (ft above amsl)

Potentiometric Surface Contour (feet amsl)

Notes
1. Groundwater levels are presented from January 2018.
2. Acronyms:
amsl - above mean sea level

N

0 125 250 500 Feet

Figure 3-9
Intermediate Groundwater Flow System
January 2018
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\07\RI\Draft RI\Figure_3-9_IntGWFlow.mxd 5/1/2019

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MW-5 Monitoring Well
356.11 Water level (ft above amsl)

Potentiometric Surface Contour (feet amsl)

Notes
1. Groundwater levels are presented from January 2018.
2. Acronyms:
amsl - above mean sea level

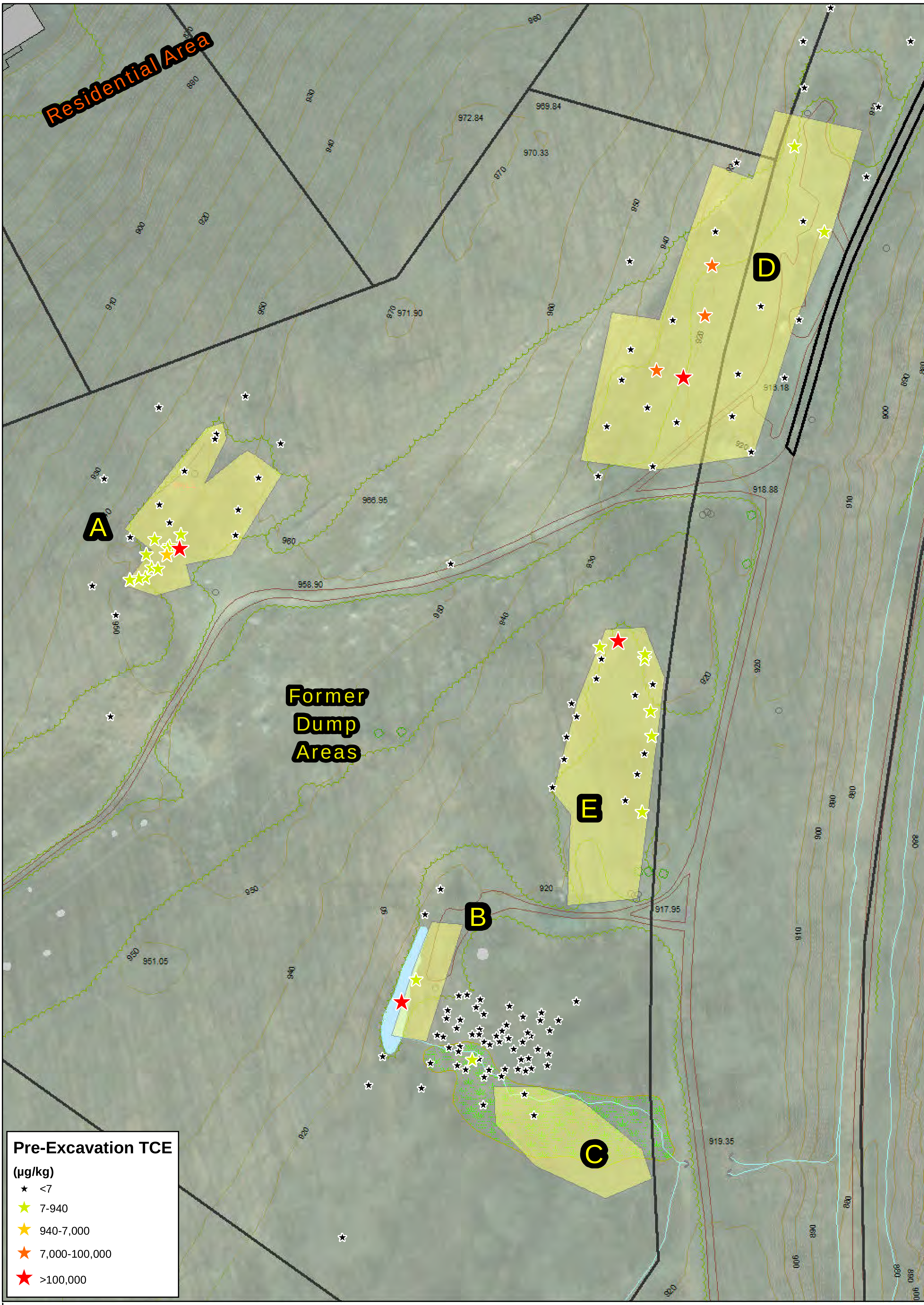
N

0 125 250 500 Feet

Figure 3-10
Deep Bedrock Groundwater Flow
January 2018
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\07\RI\Draft RI\Figure_3-10_DeepBRFLOW.mxd 5/1/2019



Former Dump Areas
Tax Parcels
Topographic Contours
50 ft Contours
5 ft Contours
Soil Screening Criteria
EPA RSL - 940 µg/kg (Human Health)
NJDEP RSDCSC - 7,000 µg/kg (Human Health)
NJ IGW - 7 µg/kg (Eco)

Notes

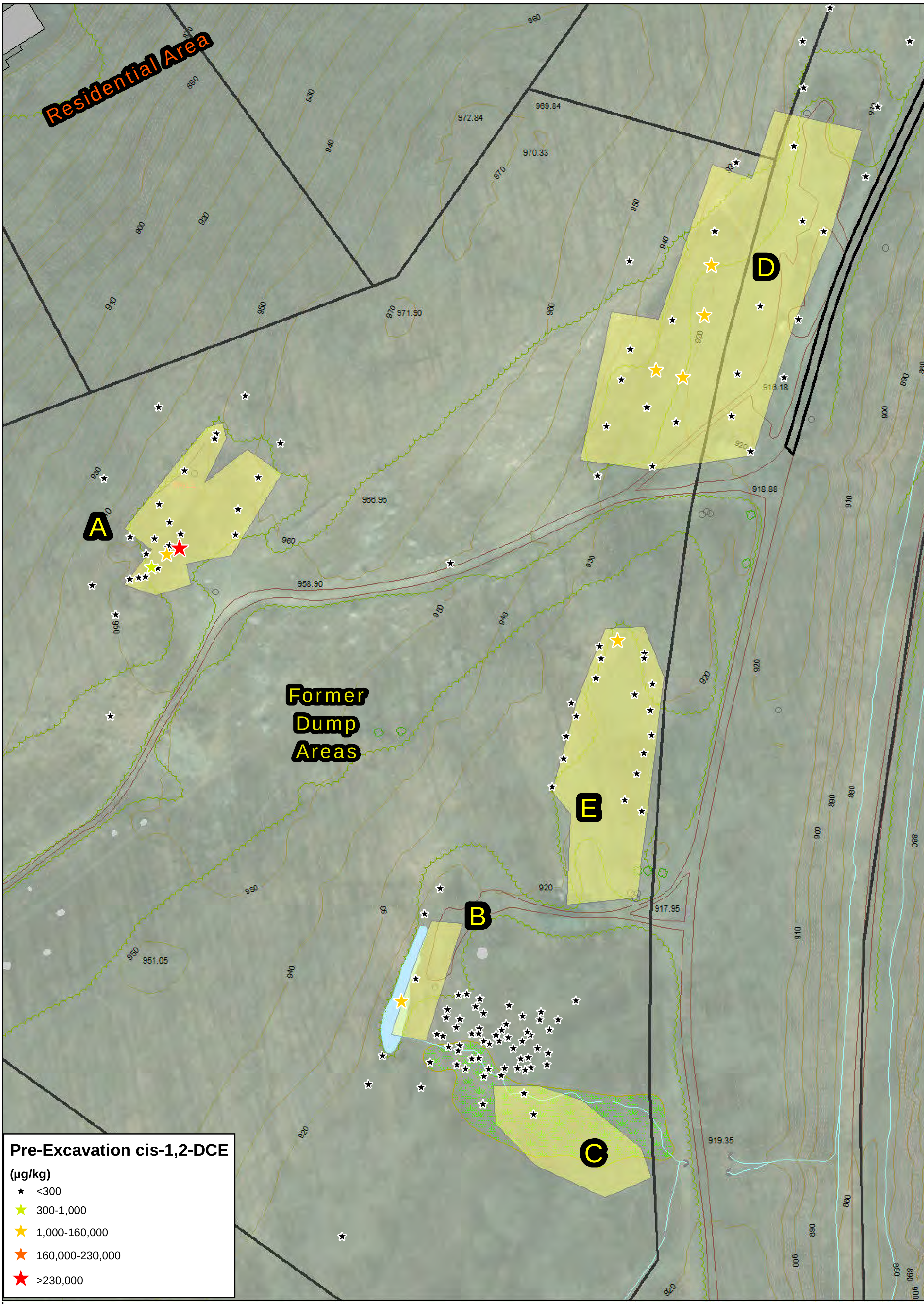
1. Soil sampling results are presented for sampling events performed prior to or during the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

0 37.5 75 150 Feet

Figure 4-1a
TCE in Former Dump Area Soils
(Pre-Excavation)
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_4-1a_Pre_ex_TCE.mxd 4/22/2018



Former Dump Areas
Tax Parcels
Topographic Contours
50 ft Contours
5 ft Contours
Soil Screening Criteria
NJ IGW - 300 µg/kg
EPA RSL - 160,000 µg/kg (Human Health)
NJDEP RSDCSC - 230,000 µg/kg (Human Health)

Notes
1. Soil sampling results are presented for sampling events performed prior to or during the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

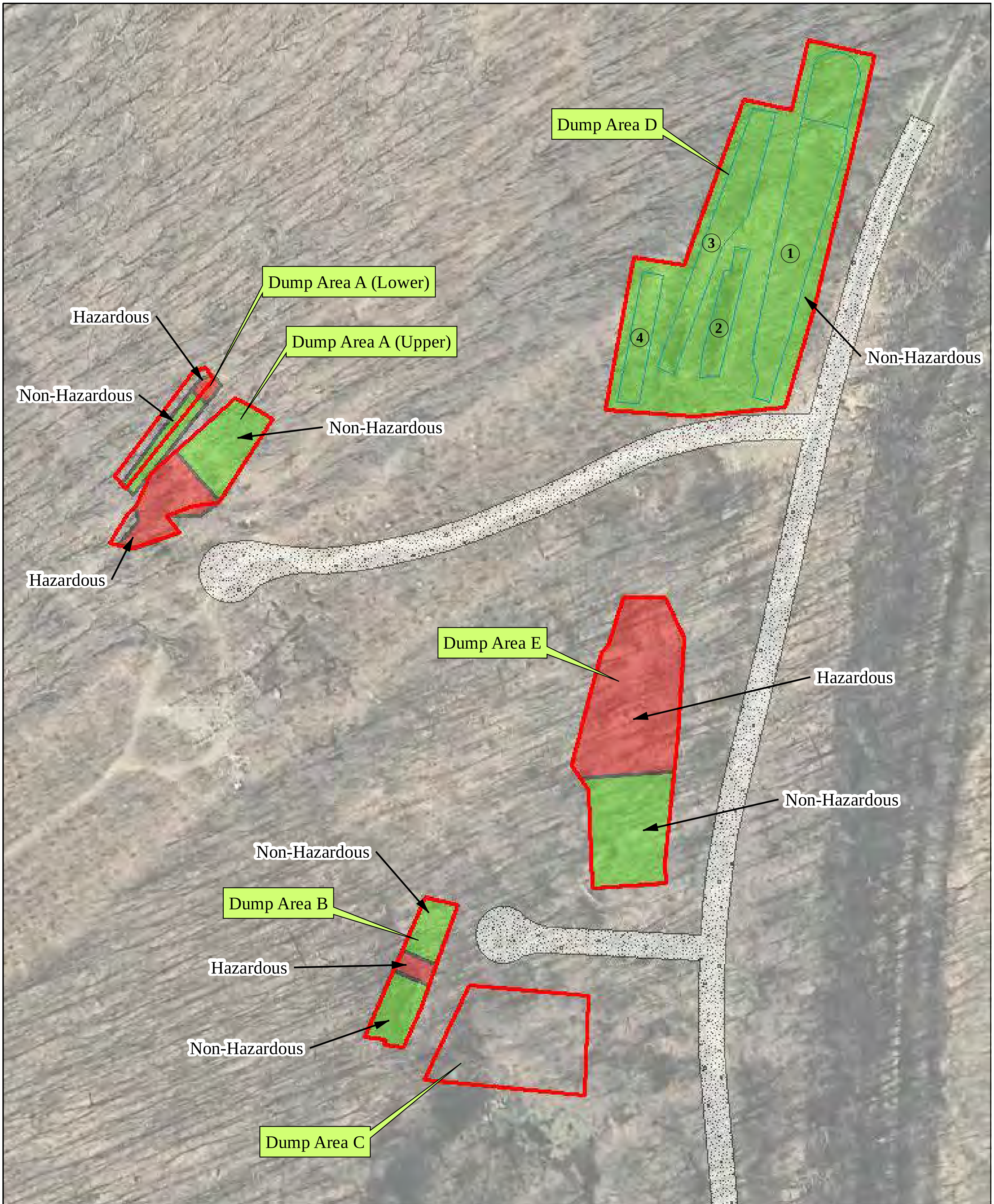
N

0 37.5 75 150 Feet

Figure 4-1b
cis-1,2-DCE in Former Dump Area Soils
(Pre-Excavation)
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_4-1b_Pre_ex_CIS.mxd 4/22/2018



Legend

Figure adapted from Weston Solutions, Inc. Final Removal Action Report (January 2013)

Access Road
Dump Area
④ Area D Trenches
Hazardous Waste Material
Non-Hazardous Waste Material

0 50 100 200 Feet

N E S W

Figure 4-2

Excavation and Waste Characterization Map

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith

Figure adapted from Weston Solutions, Inc. Final Removal Action Report (January 2013)

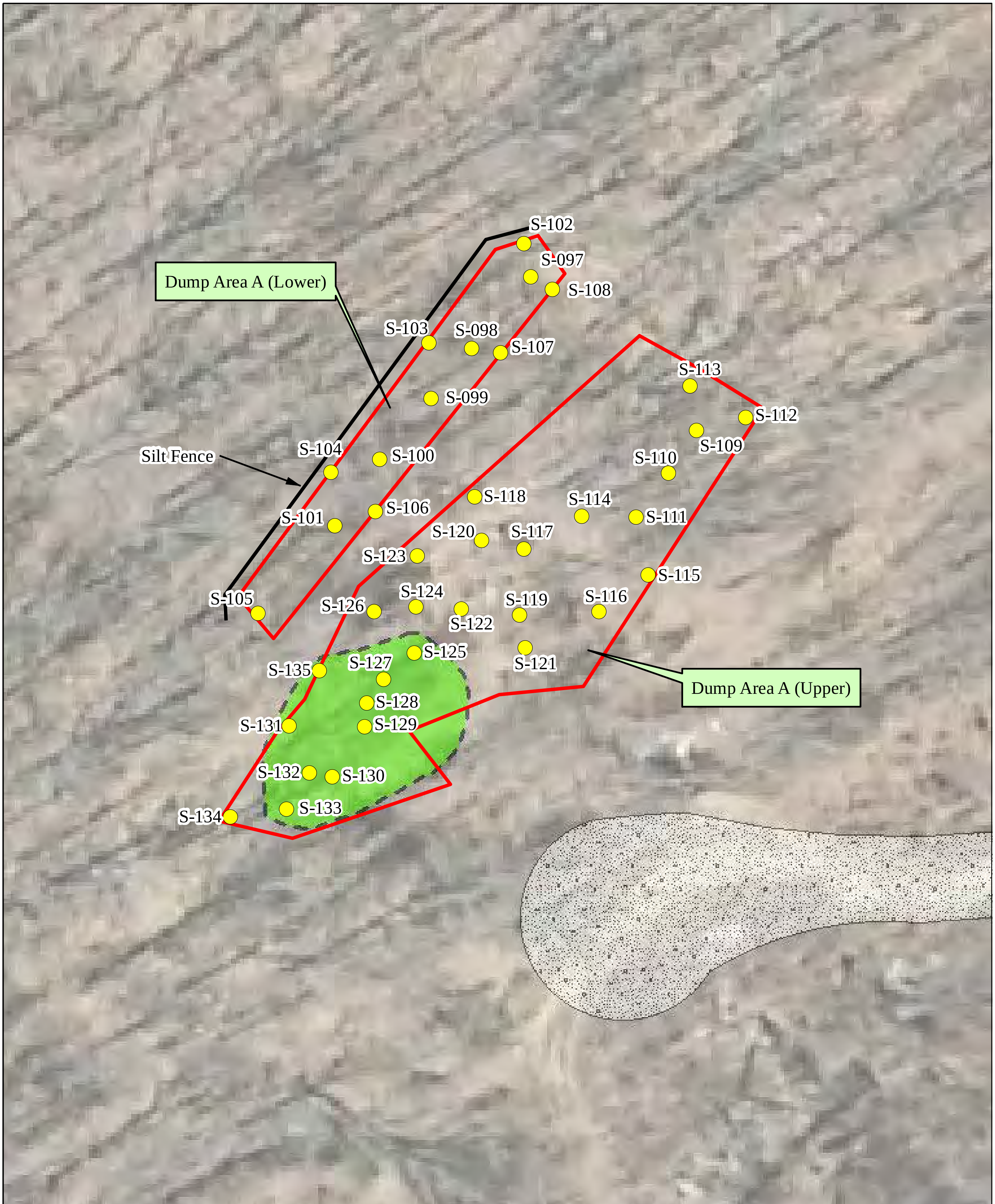
Figure 4-3

Excavated Soil Stockpile Map

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith



Legend

Figure adapted from Weston Solutions, Inc. Final Removal Action Report (January 2013)

- Dump Area A Sample Locations
- Silt Fence
- Area of Re-excavation
- Access Road
- Dump Areas

0 15 30 60 Feet

N E S W

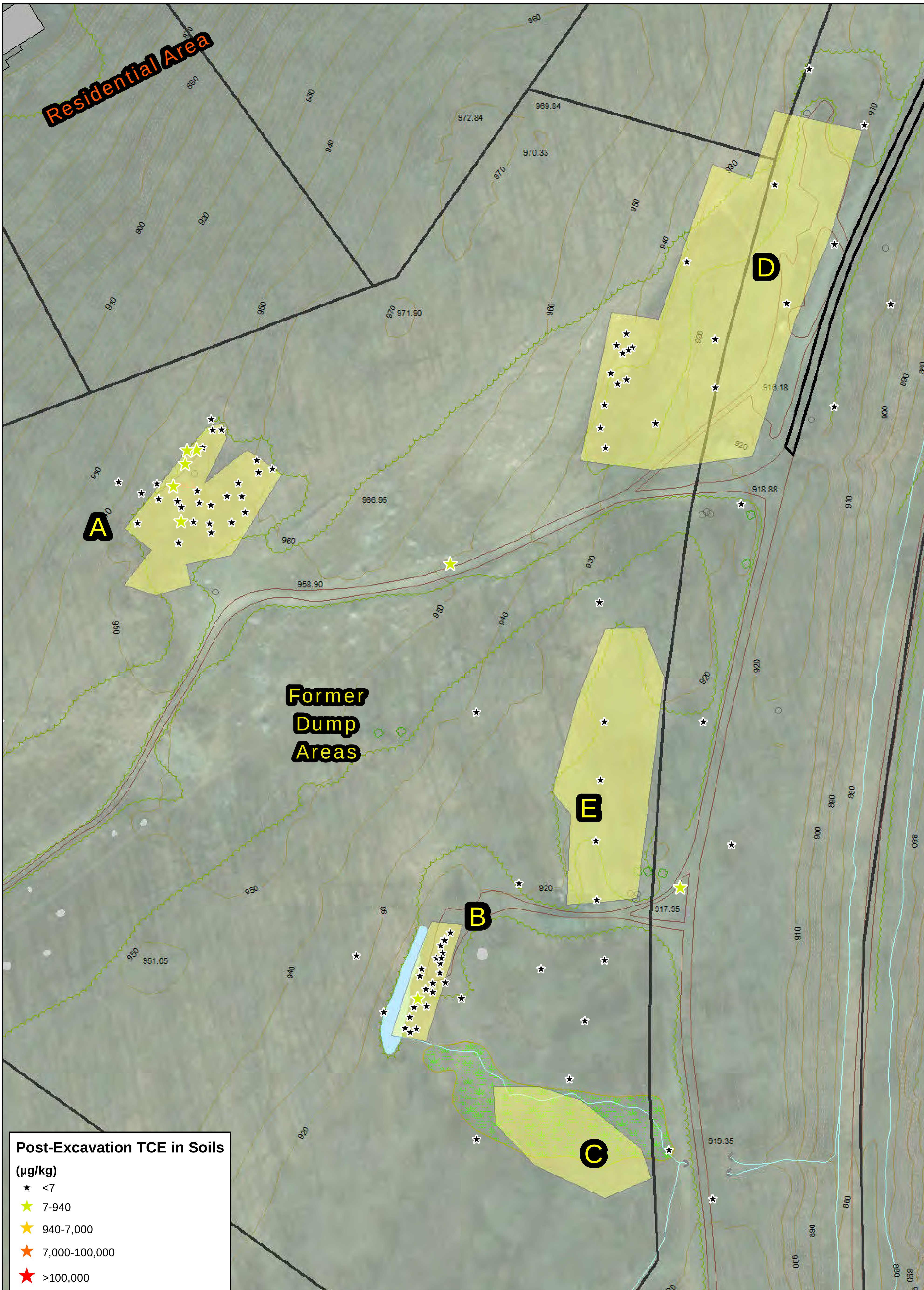
Figure 4-4

Re-Excavation Area Map

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith



Former Dump Areas

Tax Parcels

Topographic Contours

50 ft Contours

5 ft Contours

Soil Screening Criteria

EPA RSL - 940 ug/kg (Human Health)

NJDEP RSDCSC - 7,000 ug/kg (Human Health)

NJ IGW - 7 ug/kg (Eco)

Notes

1. Soil sampling results are presented for sampling events performed following the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

N

0 37.5 75 150 Feet

Figure 4-5a

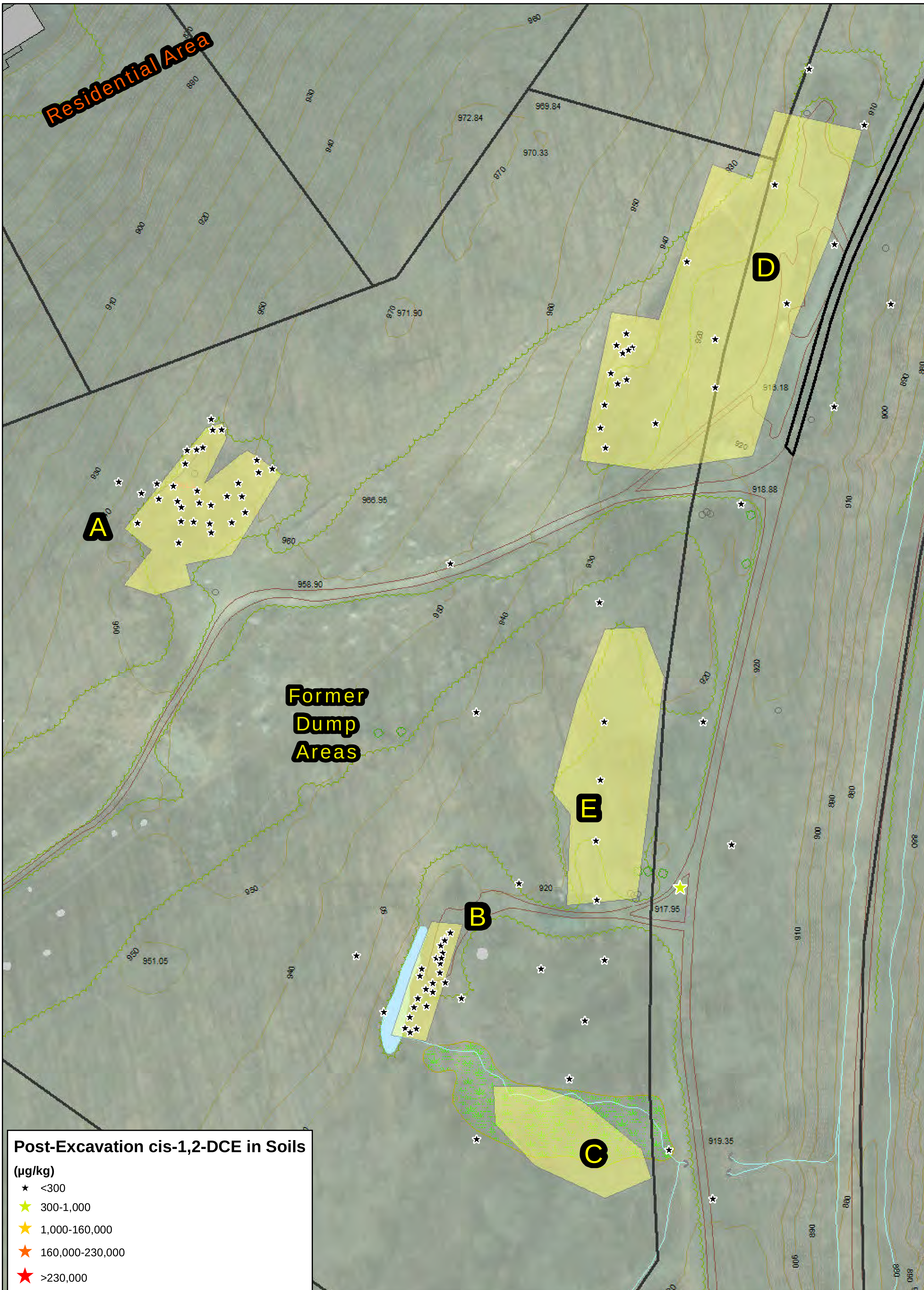
TCE in Former Dump Area Soils (Post-Excavation)

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_4-5a_Post_ex_TCE.mxd 4/22/2018



Former Dump Areas

Tax Parcels

Topographic Contours

50 ft Contours

5 ft Contours

Soil Screening Criteria

NJ IGW - 300 µg/kg

EPA RSL - 160,000 µg/kg (Human Health)

NJDEP RSDCSC - 230,000 µg/kg (Human Health)

Notes

1. Soil sampling results are presented for sampling events performed after the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

N

0 37.5 75 150 Feet

Figure 4-5b

cis-1,2-DCE in Former Dump Area Soils (Post-Excavation)

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Fig_4-5b_Post_ex_CIS.mxd 4/22/2018

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Seep and Surface Soil
Catch Basin Water

Tax Parcels
Former Dump Areas

MW-X Monitoring Well
ND TCE Concentration (ug/l)
ND cis-1,2-DCE Concentration (ug/L)

Notes
1. Groundwater results are presented for the November 2017 sampling.
2. Seep results (in blue) are presented for the 2017 sampling round.
3. Exceedances of the RI screening criteria are highlighted orange.
4. Acronyms:
   J - estimated value
   ND - non detect
   TCE - Trichloroethene

TCE concentration isocontour (ug/L)

N

0 125 250 500 Feet

Figure 4-6
TCE and CIS-1,2-DCE in Overburden Groundwater
November 2017 (Round 2)
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-6_R2_OB_TCE_CIS_AR_REQ.mxd 6/11/2018

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MLS-1-P1 — Monitoring Well
ND — TCE Concentration (ug/l)
ND — cis-1,2-DCE Concentration (ug/L)

Notes
1. Groundwater results are presented for the November 2017 sampling. The port with the highest concentration is presented.
2. Exceedances of RI screening criteria are highlighted orange.
3. Acronyms:
   D - dilution
   J - estimated value
   ND - non detect
   TCE - Trichloroethene

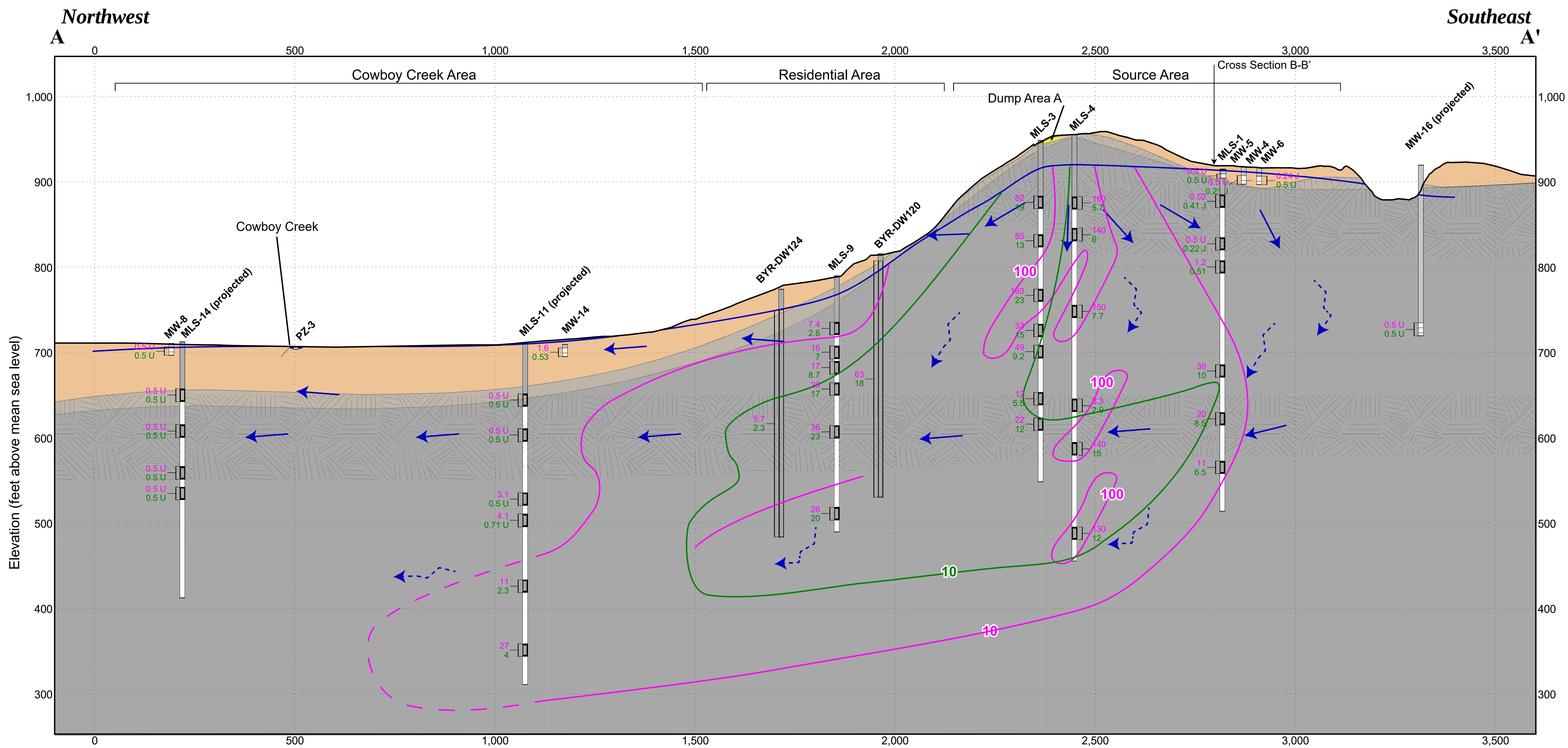
N

0 125 250 500 Feet

Figure 4-7
TCE and cis-1,2-DCE in Bedrock Groundwater
November 2017 (Round 2)
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

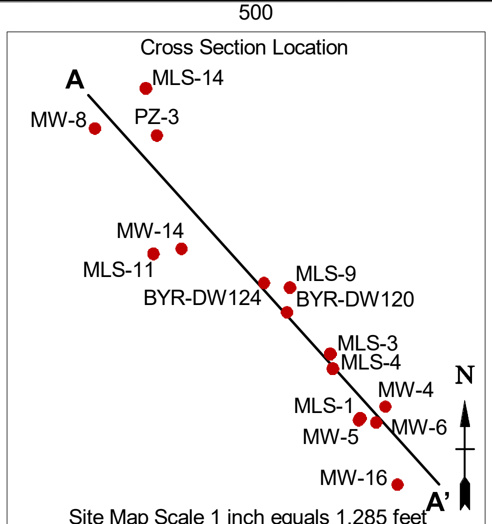
ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-7_R2_BR_TCE_CIS_AR_REQ.mxd 6/11/2018



LEGEND:

Fracture flow through competent bedrock and down dip

Fracture flow through transmissive bedrock zones



Dump Area

Overburden

Weathered Bedrock

Bedrock

Fractured/Transmissive Zone

Casing

Screened Interval

Open Borehole

Sample Interval

FLUTe Liner

FLUTe Sampling Port

TCE approximate groundwater contamination extent (dashed where inferred)

cis-1,2-DCE approximate groundwater contamination extent (dashed where inferred)

Shallow Potentiometric Surface (01/2018)

Analytical Results
Trichloroethene (TCE)
cis-1,2-Dichloroethene (cis-1,2-DCE)
All results in micrograms per liter
U - not detected, detection limit is value to left
J - estimated concentration
NC - not collected

*Residential well data collected 10/2017

Horizontal Scale (feet) 0 250

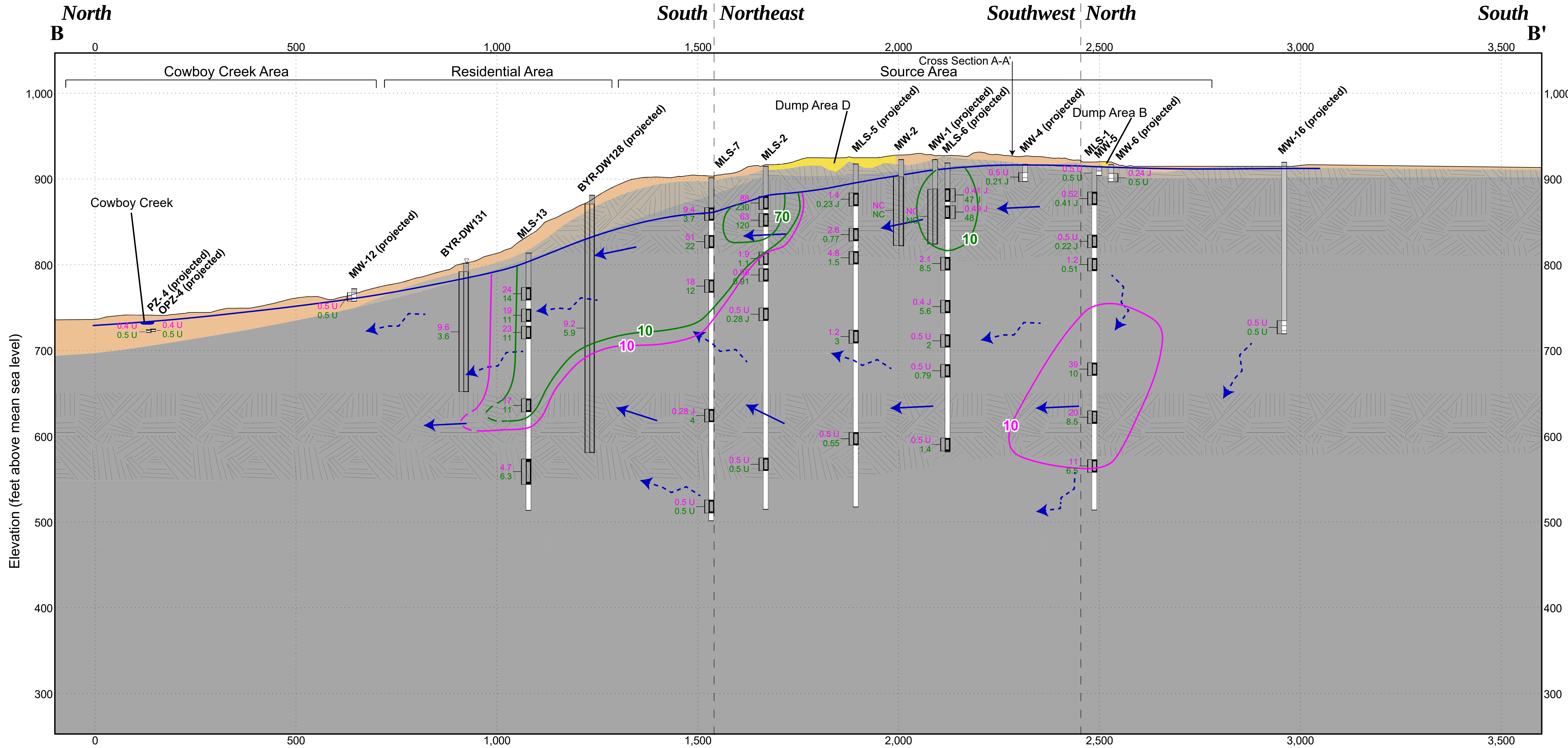
Vertical Exaggeration: 2x

Vertical Scale (feet) 0 120

CDM Smith

Figure 4-8
Cross Section A-A'
TCE and cis-1,2-DCE in Groundwater
November 2017 - Round 2
Mansfield Trail Dump Site, OU2
Byram Township, NJ

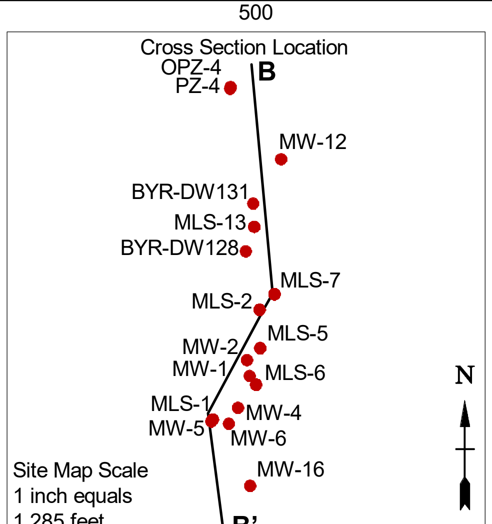
STANDARD CROSS SECTION: MANSFIELD_MANSFIELD.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 4/10/18 REV.



LEGEND:

Fracture flow through competent bedrock and along strike

Fracture flow through transmissive bedrock zones



Dump Area

Overburden

Weathered Bedrock

Bedrock

Fractured/Transmissive Zone

Casing

Screened Interval

Open Borehole

Sample Interval

FLUTe Liner

FLUTe Sampling Port

TCE approximate groundwater contamination extent (dashed where inferred)

cis-1,2-DCE approximate groundwater contamination extent (dashed where inferred)

Shallow Potentiometric Surface (01/2018)

Analytical Results
Trichlorothene (TCE)
cis-1,2-Dichloroethene (cis-1,2-DCE)
All results in micrograms per liter
U - not detected, detection limit is value to left
J - estimated concentration
NC - not collected

*Residential well data collected 10/2017

0 250
Horizontal Scale (feet)

Vertical Exaggeration: 2x

0 120
Vertical Scale (feet)

CDM Smith

Figure 4-9
Cross Section B-B'
TCE and cis-1,2-DCE in Groundwater
November 2017 - Round 2
Mansfield Trail Dump Site, OU2
Byram Township, NJ

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Residential Well

Tax Parcels
Former Dump Areas

MLS-1-P1 Monitoring Well
0.5 U TCE Concentration (ug/l)
0.5 U cis-1,2-DCE Concentration (ug/L)

Notes
1. Groundwater results are presented for the November 2017 sampling. The port with the highest concentration is presented.
2. Residential well data is posted without a property address, but is adjacent to the residential well.

Acronyms
J- estimated value
TCE - Trichloroethene
U- non detect

Figure 4-10
TCE and cis-1,2-DCE in Residential Area Wells
November 2017 (Round 2)
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-10_R2_TCE_CIS_rez_wells.mxd 5/1/2019

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MW-5 Monitoring Well
0.5 U TCE Concentration (ug/l)
0.5 U cis-1,2-DCE Concentration (ug/L)

Notes
1. Groundwater results are presented for the November 2014 sampling, when a well was not sampled the results from September 2015 are presented.
2. Acronyms:
J- estimated value
NS - Not Sampled
TCE - Trichloroethene
U- non detect

N

0 125 250 500 Feet

Figure 4-11
TCE and CIS-1,2-DCE in Overburden Groundwater
November 2014
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-11_2014_OB_TCE_CIS.mxd 4/22/2018

2017 Monitoring Well
2017 MLS Well
2017 In-Creek Piezometer
2017 Overburden Piezometers
Existing Monitoring Well
Existing MLS Well
Existing In-Creek Piezometer
Tax Parcels
Former Dump Areas

MLS-1-P1 Monitoring Well
0.5 U TCE Concentration (ug/l)
0.5 U cis-1,2-DCE Concentration (ug/L)

Notes
1. Groundwater results are presented for the November 2014 sampling, when a well was not sampled the results from September 2015 are presented.
2. Acronyms:
J- estimated value
NS - Not Sampled
TCE - Trichloroethene
U- non detect

N

0 125 250 500 Feet

Figure 4-12
TCE and cis-1,2-DCE in Bedrock Groundwater
November 2014
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\MS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-12_2014_BR_TCE_CIS.mxd 4/22/2018

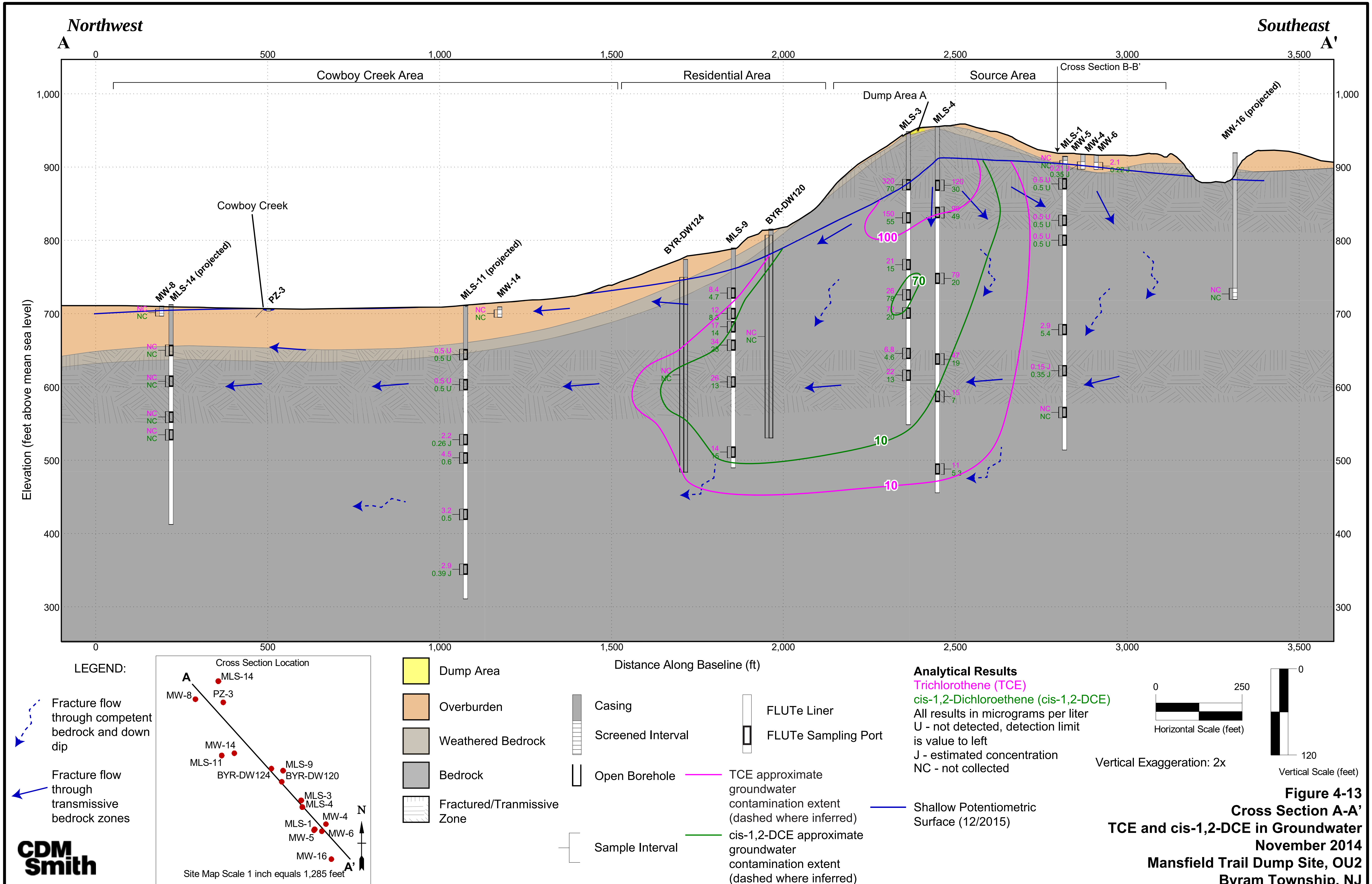
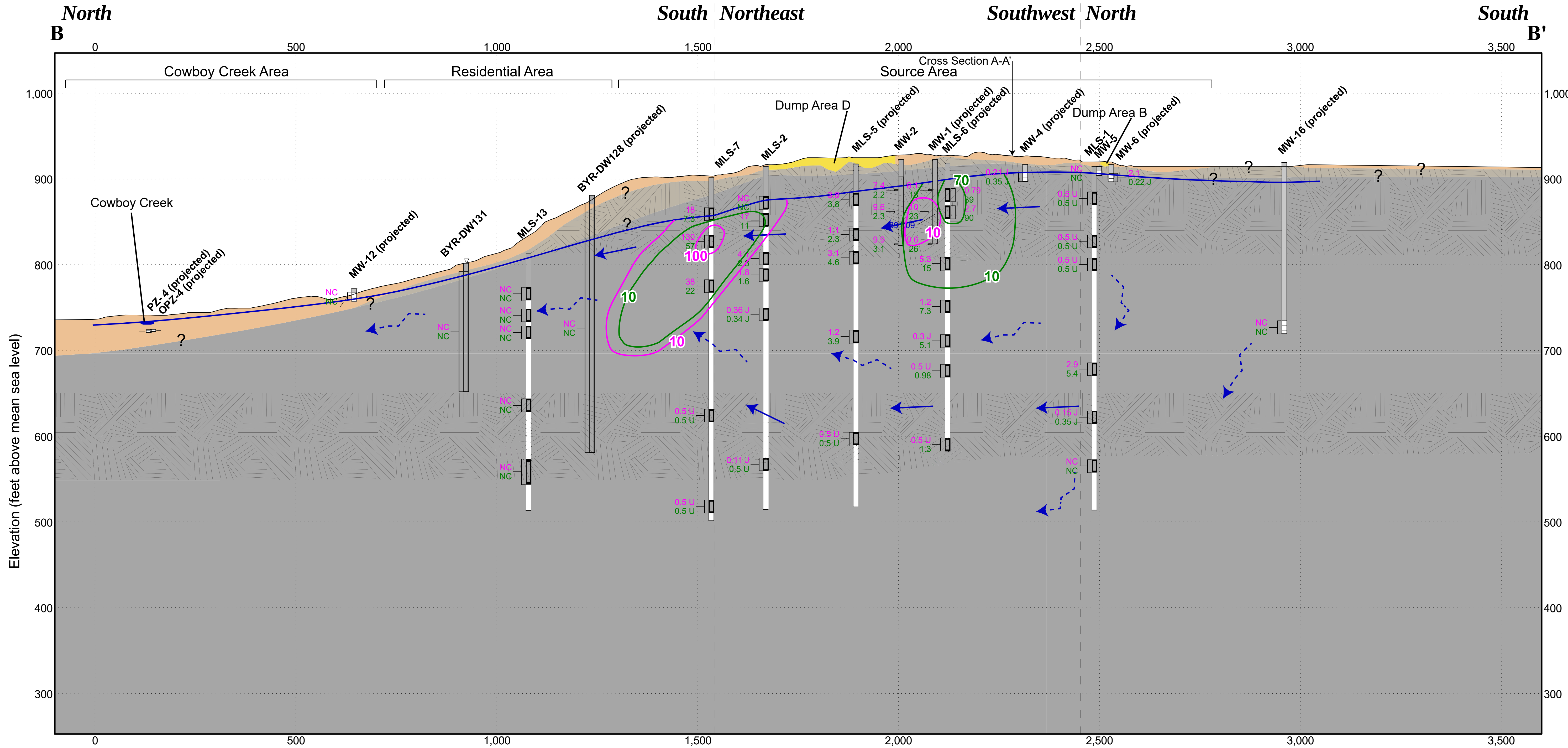


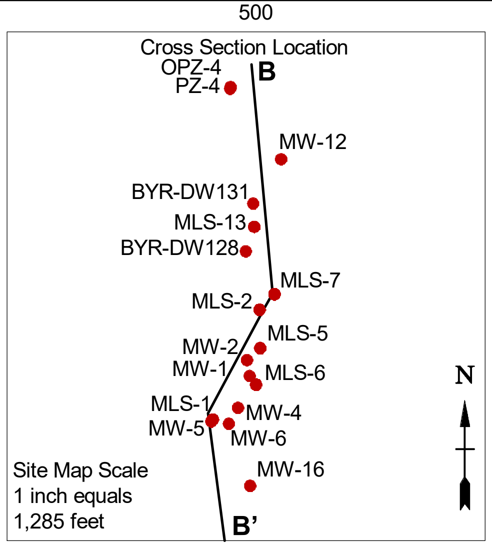
Figure 4-13
Cross Section A-A'
TCE and cis-1,2-DCE in Groundwater
November 2014
Mansfield Trail Dump Site, OU2
Byram Township, NJ



LEGEND:

Fracture flow through competent bedrock and along strike

Fracture flow through transmissive bedrock zones



Dump Area

Overburden

Weathered Bedrock

Bedrock

Fractured/Transmissive Zone

Casing

Screened Interval

Open Borehole

Sample Interval

FLUTe Liner

FLUTe Sampling Port

TCE approximate groundwater contamination extent (dashed where inferred)

cis-1,2-DCE approximate groundwater contamination extent (dashed where inferred)

Shallow Potentiometric Surface (12/2015)

Analytical Results
Trichlorothene (TCE)
cis-1,2-Dichloroethene (cis-1,2-DCE)
All results in micrograms per liter
U - not detected, detection limit is value to left
J - estimated concentration
NC - not collected

Horizontal Scale (feet): 0, 250

Vertical Exaggeration: 2x

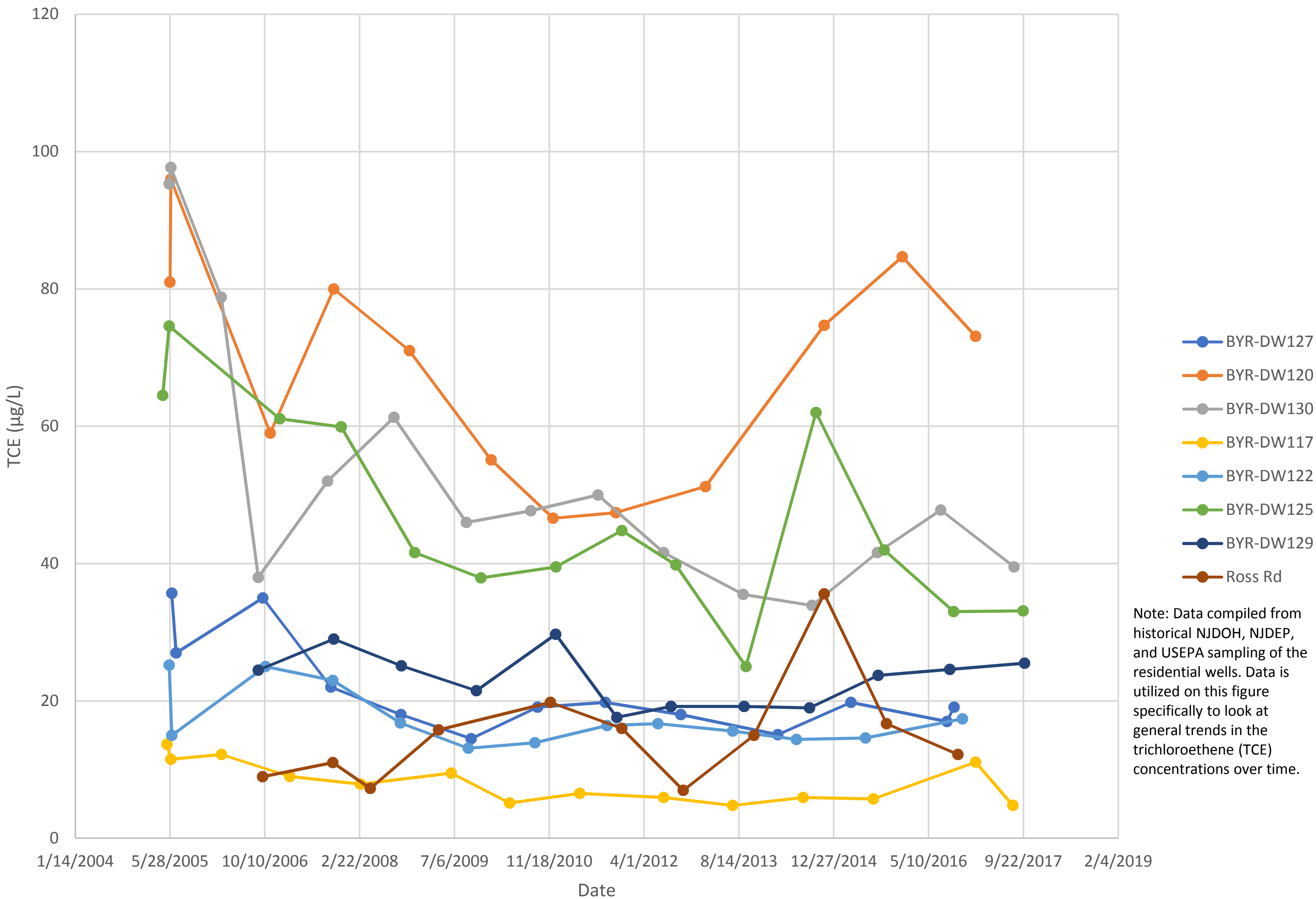
Vertical Scale (feet): 0, 120

CDM Smith

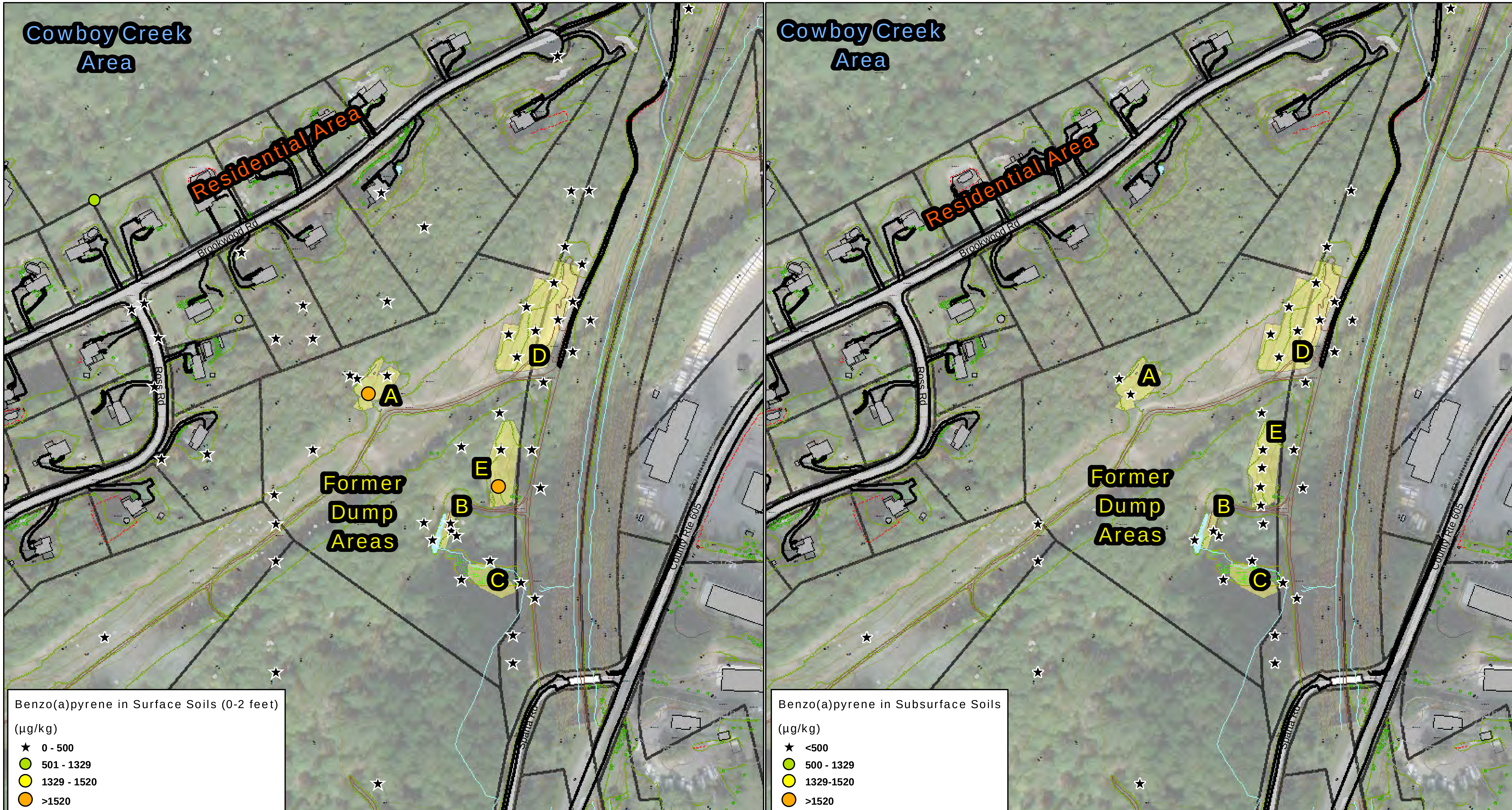
Figure 4-14
Cross Section B-B'
TCE and cis-1,2-DCE in Groundwater
November 2014
Mansfield Trail Dump Site, OU2
Byram Township, NJ

STANDARD CROSS SECTION: MANSFIELD MANSFIELD.GPJ STANDARD_ENVIRONMENTAL_PROJECT.GDT 4/12/18 REV.

Figure 4-15 - TCE in Residential Wells - 2005 to 2017



Note: Data compiled from historical NJDOH, NJDEP, and USEPA sampling of the residential wells. Data is utilized on this figure specifically to look at general trends in the trichloroethene (TCE) concentrations over time.



Former Dump Areas

Tax Parcels

Topographic Contours

50 ft Contours

5 ft Contours

Notes

1. Soil sampling results are presented for sampling events performed following the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criterias and to assist in presenting where contamination is present.

Soil Screening Criteria

EPA RSL - 110 µg/kg (Human Health)

NJDEP RSDCSC - 500 µg/kg (Human Health)

ECO SSLs - 1,100 µg/kg (Eco)

Site Background - 1,329 µg/kg

N

0 125 250 500 Feet

Figure 4-16

Post-Excavation Soil Sample Results

Benzo(a)pyrene

Mansfield Trail Dump Site, OU2

Byram Township, NJ

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ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-16_Soil_BAP.mxd 4/19/2019

2017 RI Sampling Locations

In-Creek Piezometer (Surface Water and Sediment Co-Located)

Initial RI Sampling Locations

2014 Sediment/ Surface Water Sample

Existing In-Creek Piezometer (co-located surface water and sediment sample)

Former Dump Areas

Tax Parcels

Sediment Screening Criteria

EPA RSL - 110 µg/kg (Human Health)
NJDEP Freshwater Sediment - 150 µg/kg (Eco)
Site Background - 20,185 µg/kg

Topographic Contours

50 ft Contours
5 ft Contours

Notes

1. Sediment and soil sampling results are presented for sampling events performed following the removal action in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

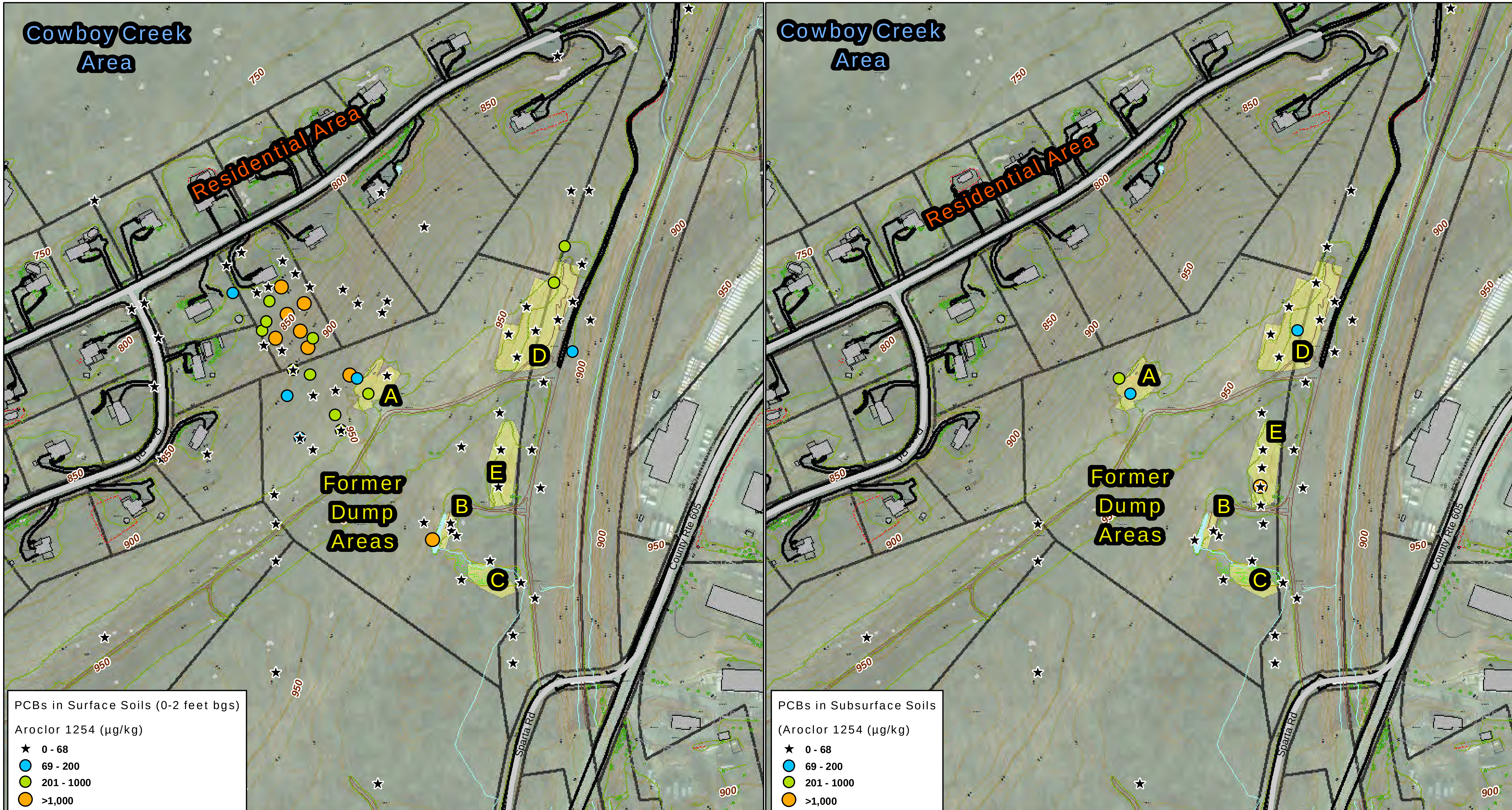
N

0 250 500 1,000 Feet

Figure 4-17

Sediment Sample Results - PAHs
Benzo(a)pyrene
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith



Former Dump Areas
Tax Parcels

Topographic Contours

50 ft Contours
5 ft Contours

Notes

1. Soil sampling results are presented for sampling events performed following the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

Soil Screening Criteria

Site Background - 68 µg/kg
NJDEP RSDCSC - 200 µg/kg (Human Health)
EPA ECo SSLs - 371 µg/kg (Eco)
NJDEP NRSDCSC - 1,000 µg/kg (Human Health)

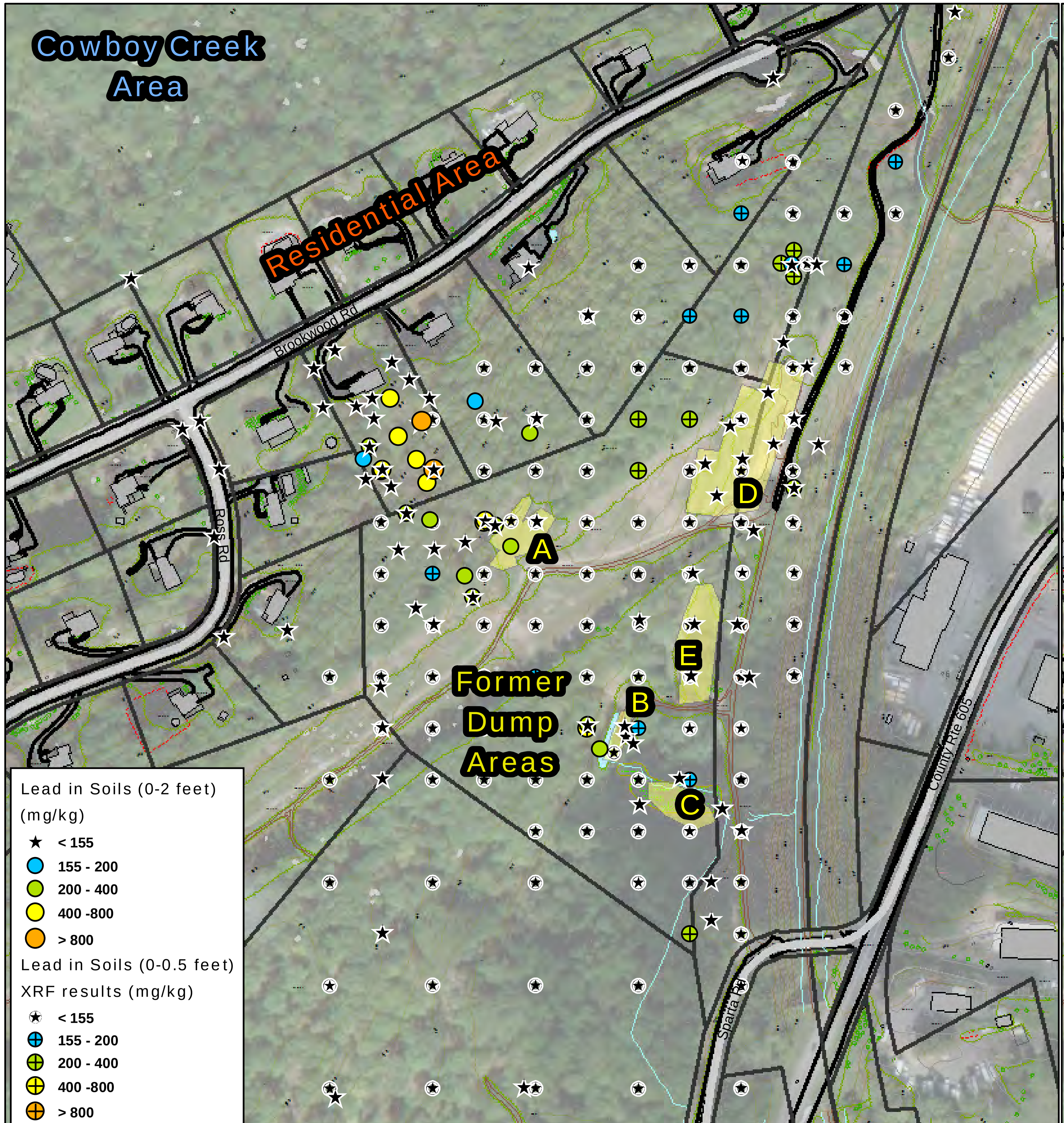
N

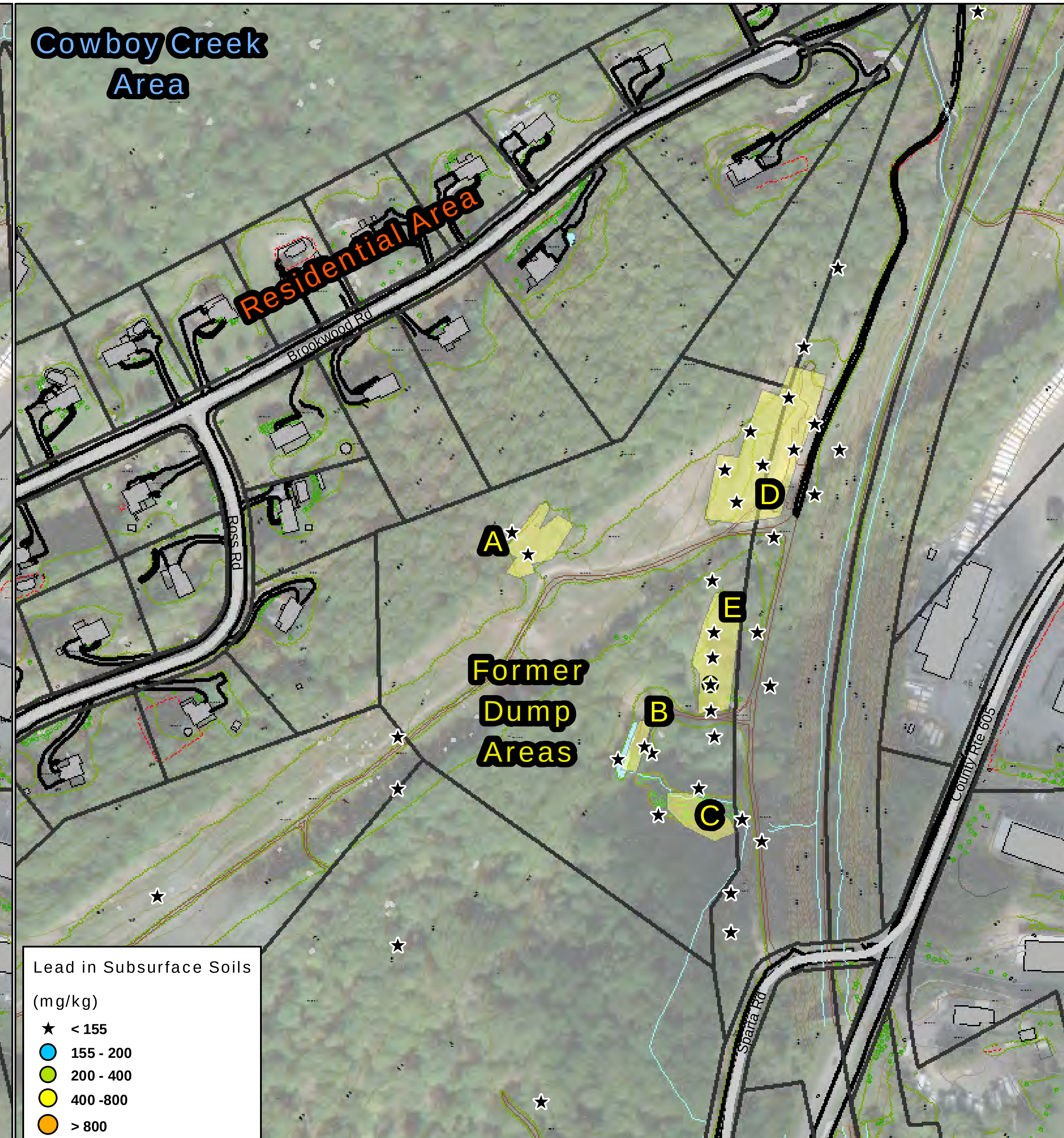
0 125 250 500 Feet

Figure 4-18
Post-Excavation Soil Sample Results
Aroclor-1254
Mansfield Trail Dump Site, OU2
Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-18_Soil_PCBs.mxd 4/26/2018





Former Dump Areas

Tax Parcels

Topographic Contours

50 ft Contours

5 ft Contours

Notes

1. Soil sampling results are presented for sampling events performed following the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

Soil Screening Criteria

Site Background - 155 mg/kg

NJDEP RSDCSC - 400 mg/kg (Human Health)

EPA RSL - 400 mg/kg (Human Health)

NJDEP NRSDCSC - 800 mg/kg (Human Health)

N

0 125 250 500 Feet

Figure 4-19

Post-Excavation Soil Sample Results - Lead

Mansfield Trail Dump Site, OU2

Byram Township, NJ

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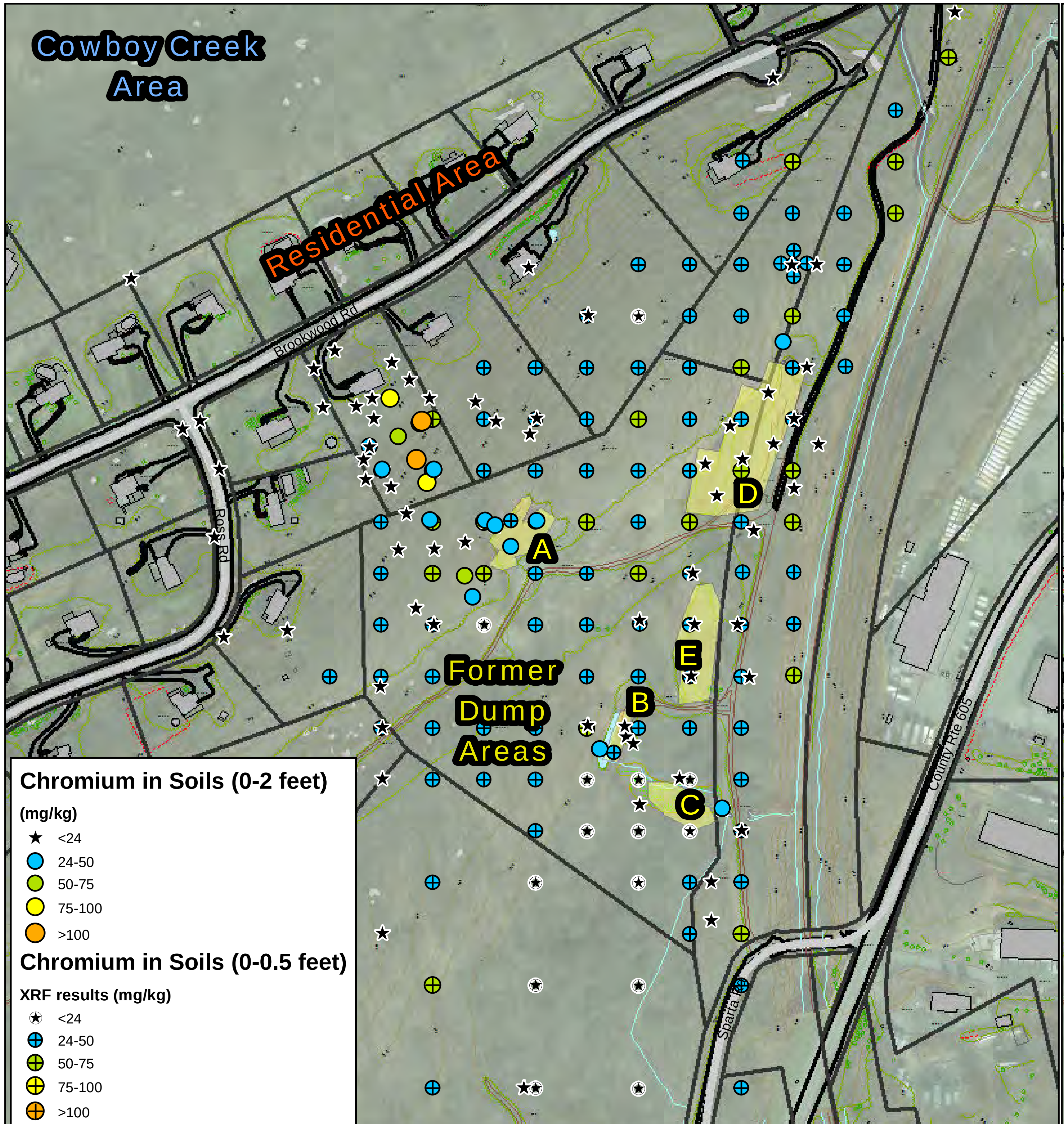
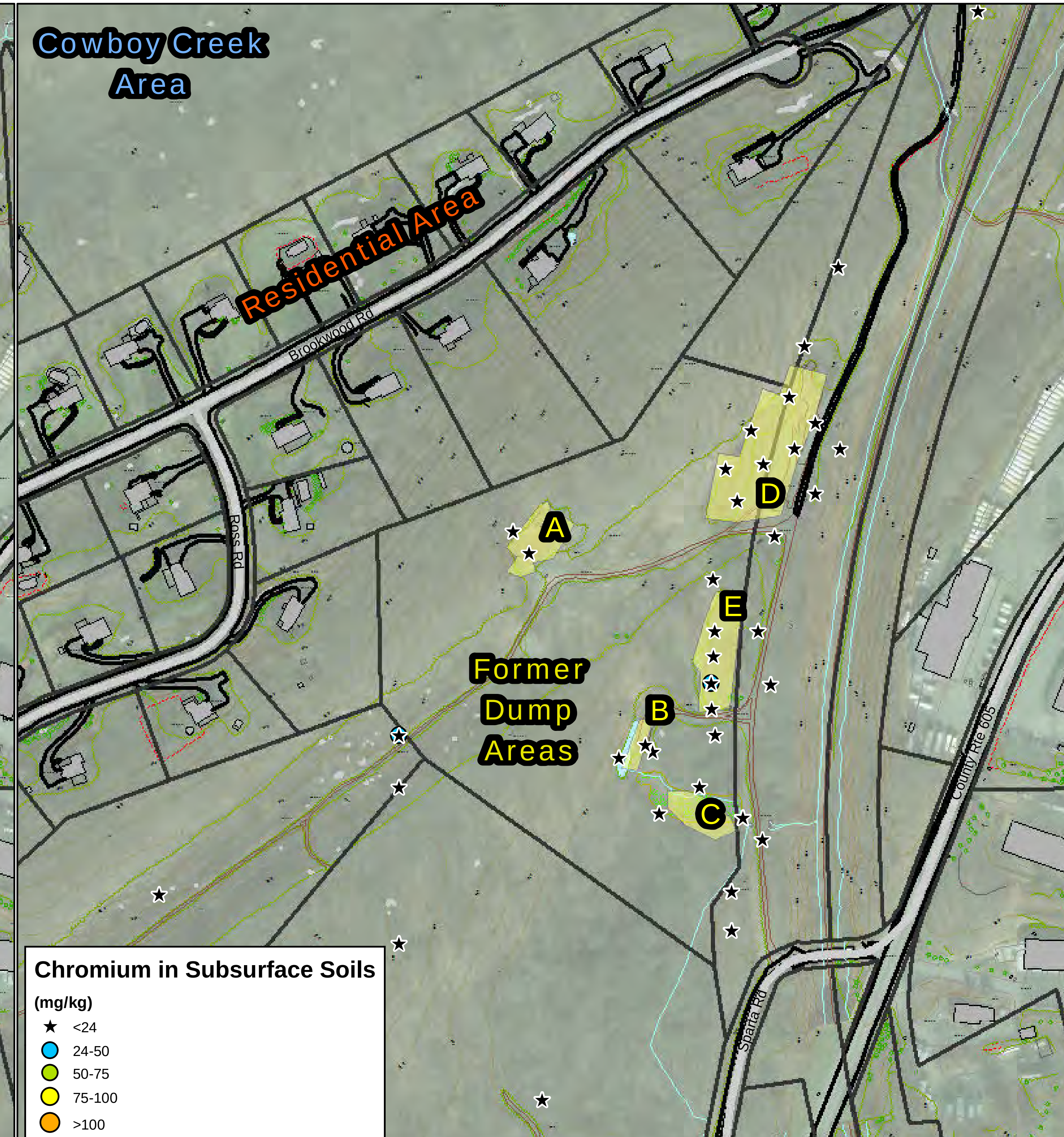
ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-19_Soil_Lead.mxd 4/19/2019





Former Dump Areas

Tax Parcels

Topographic Contours

50 ft Contours

5 ft Contours

Notes

1. Soil sampling results are presented for sampling events performed following the removal actions in 2012.
2. Data is color coded by concentration groups to represent various screening criteria and to assist in presenting where contamination is present.

Soil Screening Criteria

EPA RSL - 0.3 mg/kg (Human Health - if hexavalant)

NJDEP RSDCSC - 1 mg/kg (Human Health - if hexavalant)

Site Background - 24 mg/kg

N

0 125 250 500 Feet

Figure 4-20

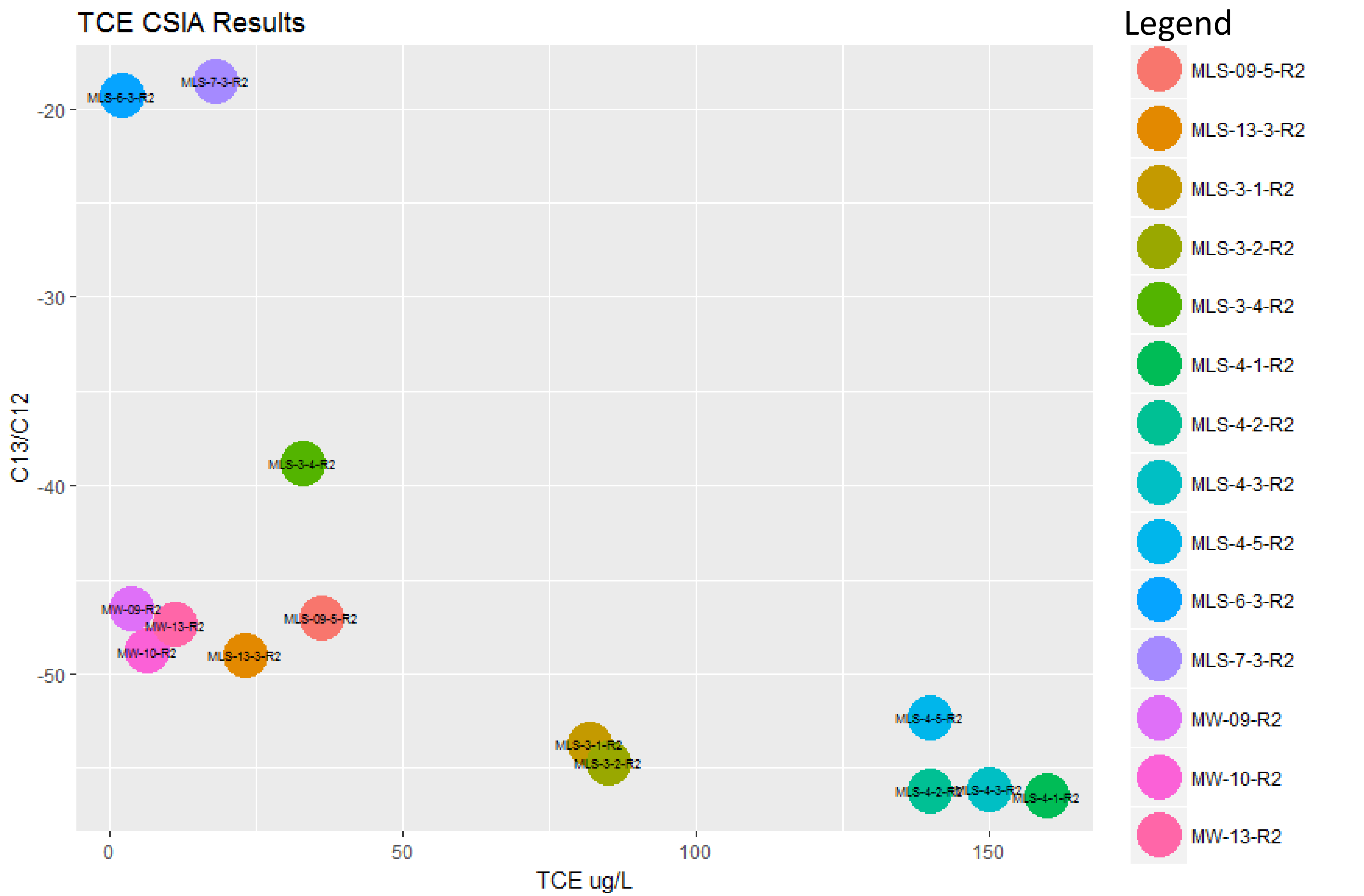
Post-Excavation Soil Sample Results - Chromium

Mansfield Trail Dump Site, OU2

Byram Township, NJ

CDM Smith

ButtonJS C:\IMS\GIS\Mansfield Trail Dump Site\MXD\070\RI\Draft RI\Figure_4-20_Soil_Chromium.mxd 4/23/2018



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Acronyms:
CSIA – Compound Specific Isotope Analysis
TCE – trichloroethene
ug/L – microgram per liter

Figure 5-1
TCE CSIA Results
Mansfield Trail Dump Site, OU2
Byram Township, NJ

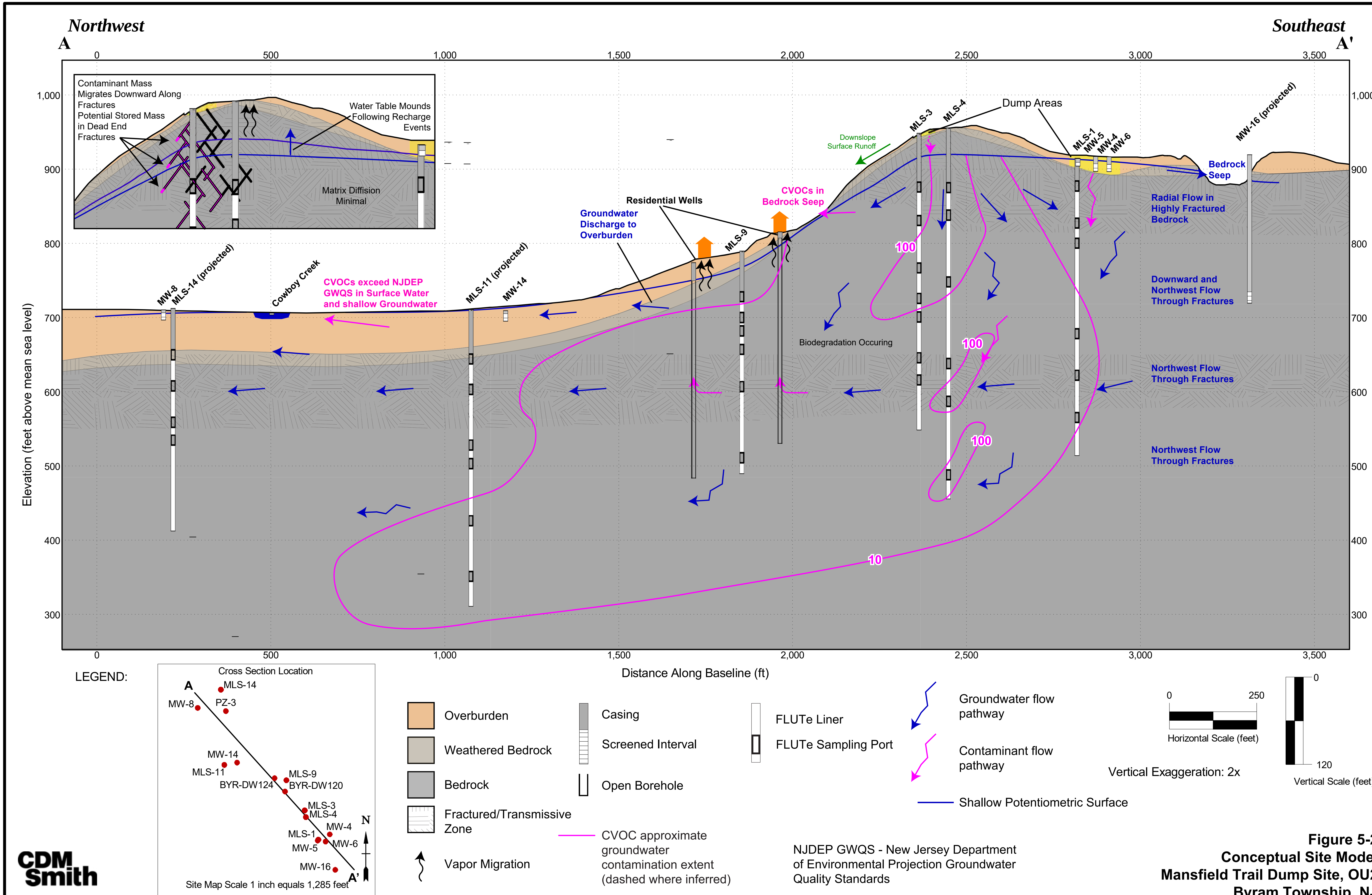

Figure 5-2
Conceptual Site Model
Mansfield Trail Dump Site, OU2
Byram Township, NJ